

Human Health and Screening Level Ecological Risk Assessment

For:

The Quality Analytical Services (QAS) Site
1633 Marsh Avenue
Blue Summit, Missouri

August 15, 2007

Prepared for:

Deffenbaugh Industries, Inc.
P.O. Box 3220
Shawnee, KS 66203

Prepared by:



Shaw Environmental & Infrastructure, Inc.

Shaw Environmental, Inc.
14155 Farmington Road
Livonia, MI 48154

Laura Tesch, Scientist, Risk Assessor
HHRA/EA Preparer

Mark Finney
Client Program Manager

Donald Huff, PhD, Client Program Manager
Technical Review



Human Health and Ecological Risk Assessment

The Quality Analytical Services (QAS) Site
1633 Marsh Avenue, Blue Summit, Missouri

August 15, 2007

Human Health and Screening Level Ecological Risk Assessment

For:

The Quality Analytical Services (QAS) Site
1633 Marsh Avenue
Blue Summit, Missouri

August 15, 2007

Prepared for:

Deffenbaugh Industries, Inc.
P.O. Box 3220
Shawnee, KS 66203

Prepared by:



Shaw Environmental & Infrastructure, Inc.

Shaw Environmental, Inc.
14155 Farmington Road
Livonia, MI 48154

A handwritten signature in cursive script, appearing to read "Laura", written over a horizontal line.

Laura Tesch, Scientist, Risk Assessor
HHRA/EA Preparer

A handwritten signature in cursive script, appearing to read "Mark C. Finney", written over a horizontal line.

Mark Finney
Client Program Manager

A handwritten signature in cursive script, appearing to read "Don Huff", written over a horizontal line.

Donald Huff, PhD, Client Program Manager
Technical Review

Table of Contents

1.0	Introduction.....	1
2.0	Site Description and Land Use	2
2.1	Current Land Use.....	2
2.2	Future Land Use	4
2.2.1	Current Groundwater Use.....	4
2.2.2	Suitability	4
2.2.3	Availability of Alternative Water Supplies.....	5
2.2.4	Activity and Use Limitations (AULs)	5
2.2.5	Urban Development.....	5
2.3	Summary of Potential On-Site Groundwater Use as Potable Water	5
3.0	Summary of Comprehensive Investigation Findings.....	6
3.1	Soil and Groundwater Investigation Summary.....	6
3.2	Closure Certification and Interim Measure Activities.....	6
3.3	Site Geology	7
3.4	Site Hydrogeology.....	8
3.5	Nature and Extent Characterization	10
3.5.1	Soil.....	10
3.5.2	Groundwater	10
3.5.3	Surface Water and Sediment.....	13
4.0	Human Health Risk Assessment.....	15
4.1	Data Evaluation and Compilation.....	15
4.1.1	Soil Data	15
4.1.2	Groundwater Data.....	16
4.1.3	Surface Water and Sediment Data	17
4.2	Exposure Assessment	17
4.2.1	Conceptual Site Model.....	18
4.2.2	Exposure Pathway Analysis.....	19
4.2.2.1	Soil	20
4.2.2.2	Groundwater.....	21
4.2.2.3	Groundwater Without Extraction System Operation	22
4.2.2.4	Ambient and Indoor Air.....	22
4.2.2.5	Surface Water and Sediment.....	23
4.2.3	Identification of Constituents of Potential Concern.....	23
4.2.3.1	Soil COPC Screening	24
4.2.3.2	Groundwater COPC Screening	25
4.2.3.3	Groundwater Transport Modeling COPCs	25
4.2.3.4	LNAPL Screening	26
4.2.3.5	Groundwater to Indoor Air COPC Screening	27
4.2.3.6	Surface Water COPC Screening	27
4.2.3.7	Sediment COPC Screening	28
4.2.3.8	Summary of COPC Screening.....	29
4.2.4	Quantification of Potential Exposures	29
4.2.4.1	Determination of Exposure Point Concentrations	29
4.2.4.2	Determination of Chemical Intakes.....	33

4.3	Toxicity Assessment	38
4.3.1	Non-Carcinogens	39
4.3.2	Carcinogens	40
4.4	Risk Characterization	41
4.4.1	Hypothetical Potable Use of Impacted Groundwater	42
4.4.2	On-Site and Off-Site Area 1	43
4.4.2.1	Soil Exposures	43
4.4.2.2	Groundwater Exposures	43
4.4.2.3	Off-Site Area 1 Risk Characterization Summary	44
4.4.3	Off-Site Area 2	45
4.4.4	Inactive Groundwater Remediation Controls Scenarios	45
4.5	Uncertainty Analysis	46
4.5.1	Environmental Sampling and Analysis and Selection of COPCs	46
4.5.2	Exposure Assessment	47
4.5.3	Toxicity Assessment	49
5.0	Screening Level Ecological Risk Assessment	51
5.1	Introduction	51
5.2	Preliminary Problem Formulation	51
5.2.1	Environmental Setting	51
5.2.2	Constituents of Potential Ecological Concern	52
5.2.3	Ecological Site Conceptual Model	53
5.2.4	Assessment and Measurement Endpoints	54
5.2.5	Ecological Effects Evaluation	54
5.2.6	Results of Ecological Screening Level Comparison	55
5.2.6.1	Surface Water Screening	55
5.2.6.2	Sediment Screening	56
5.2.6.3	Groundwater to Oxbow Modeling Screening	56
5.2.6.4	Surface Water and Sediment Sample Screening Summary	57
5.3	Uncertainty Analysis	57
5.4	Scientific Management Decision Point	58
6.0	Summary and Conclusions	59
7.0	References	62

Tables

Table 3-1	Summary of Detected Volatile Organic Compounds in Soils
Table 3-2	Analytical Results for SVOCs, Pesticides and Hex Chromium
Table 3-3	Summary of Detected Pesticides and PCBs In Soils
Table 3-4	Summary of Detected Metals in Soils
Table 3-5	Summary of Total Metals in Surface Water – Oxbow
Table 3-6	Summary of Metal Results for Oxbow Sediment Samples
Table 4-1	Selection of Exposure Pathways
Table 4-2	Comparison of Detected Metals in Soil to Background Levels
Table 4-3	Summary of Occurrence, Distribution and COPC Screening for Soil
Table 4-4a	Comparison of Detected Metals in Groundwater to Background Levels

Table 4-4b	Summary of Occurrence, Distribution and COPC Screening for Groundwater
Table 4-4c	Summary of COPC Screening for Groundwater to Indoor Air
Table 4-5a	Summary of Occurrence, Distribution and COPC Screening for Surface Water
Table 4-5b	Summary of Occurrence, Distribution and COPC Screening for Sediments
Table 4-6	Summary of Exposure Point Concentrations (EPCs) of COPCs in Soil: Off-Site Area 1
Table 4-7	Summary of EPCs of COPCs in Groundwater: On-Site/Off-Site Area 1
Table 4-8	Summary of EPCs of COPCs in Groundwater: Off-Site Area 2
Table 4-9	Calculation of Soil to Ambient Air EPC: Off-Site Area 1
Table 4-10	Domenico Model Assumptions
Table 4-11	Chemical-Specific Parameters for Domenico Model
Table 4-12a	Domenico fate and transport model results
Table 4-12b	BIOCHLOR fate and transport model results
Table 4-13	Daily Intake Values for Commercial/Industrial Workers: Soil Exposures
Table 4-14	Daily Intake Values for Construction Workers: Soil Exposures
Table 4-15a	Groundwater to Surface Water EPCs - Recreational User
Table 4-15b	Values Used for Daily Intake Calculations: Adult Recreational User
Table 4-15c	Values Used for Daily Intake Calculations: Child Recreational User
Table 4-16a	Calculations Dermal Event for Organic Compounds: Surface Water
Table 4-16b	Calculations Event for Inorganic Compounds: Surface Water
Table 4-17a	Inhalation Non-Cancer and Cancer Toxicity Data
Table 4-17b	Oral/Dermal Non-Cancer and Cancer Toxicity Data
Table 4-18	Oral/Dermal Non-Cancer and Cancer Toxicity Data – Recreational Scenario COPCs
Table 4-19a	Calculation of Non-Cancer Hazards for Indoor Commercial/Industrial Worker: Soil
Table 4-19b	Calculation of Non-Cancer Hazards for Outdoor Commercial/Industrial Worker: Soil
Table 4-20a	Calculation of Cancer Risks for Indoor Commercial/Industrial Worker: Soil
Table 4-20b	Calculation of Cancer Risks for Outdoor Commercial/Industrial Worker: Soil
Table 4-21	Calculation of Non-Cancer Hazards for Construction Worker: Soil
Table 4-22	Calculation of Cancer Risks for Construction Worker: Soil
Table 4-23	Summary of Indoor Pathway Risks from Soil and Groundwater COPCs
Table 4-24	Calculation of Non-Cancer Hazards for Adult Recreational Users: Surface Water
Table 4-25	Calculation of Non-Cancer Hazards for Child Recreational Users: Surface Water
Table 4-26	Calculation of Cancer Risks for Recreational User: Surface Water
Table 4-27	Summary of Receptor Risks and Hazards for COPCs
Table 4-28	Summary of Receptor Risks and Hazards for COPCs
Table 5-1	Ecological Exposure Pathways
Table 5-2a	Summary of Surface Water Results
Table 5-2b	Comparison of Detected Metals in Surface Water to Ecological Screening Levels
Table 5-3	Comparison of Detected Metals in Sediments to Ecological Screening Levels
Table 5-4	Comparison of Modeled Groundwater to Surface Water Concentrations to Ecological Screening Levels

Figures

- Figure 1 Site Location Map
- Figure 2 Site Base Map Including Monitoring Well Locations
- Figure 3 Water Well Search Map
- Figure 4 Soil Boring Locations
- Figure 5 Surface Water and Sediment Sampling Locations

Appendices

- Appendix A Water Well Search Results
- Appendix B Soil Laboratory Reports and Summary Tables
- Appendix C Groundwater Laboratory and Summary Tables
- Appendix D Surface Water and Sediment Sample Laboratory Reports
- Appendix E ProUCL Statistical Summaries
- Appendix F Johnson and Ettinger Model Output Spreadsheets
- Appendix G Domenico Model Calculations
- Appendix H Ecological Risk Checklists
- Appendix I Missouri Department of Commerce Correspondence
- Appendix J Site Land Restrictions

Acronyms

ADD	Average Daily Dose
AOC	Administrative Order on Consent
ARARs	Applicable or relevant and appropriate requirements
AST	Above ground storage tank
AULs	Activity and Use Limitations
AWQC	Ambient Water Quality Criteria
CMS	Corrective Measures Study
COPC	Constituents of potential concern
COPEC	Constituents of potential ecological concern
CSM	Conceptual Site Model
DTLs	Default Target Levels
EC	Effect Concentration
EPA	Environmental Protection Agency
EPC	Exposure point concentration
ERLs	Effects Range – Low
ETs	Ecotox Thresholds
ETVs	Ecotoxicity values
HHRA	Human Health Risk Assessment
IM	Interim measure
LADD	Lifetime Average Daily Dose
LNAPL	Light non-aqueous-phase liquid
LOAEL	Lowest observed adverse effect level
MCLs	Maximum contaminant levels
MDC	Maximum detected concentration
MDNR	Missouri Department of Natural Resources
MGD	Million gallons per day
MRBCA	Missouri Risk-Based Corrective Action
NOAEL	No observed adverse effect level
PEC	Probable Effects Concentration
PRGs	preliminary remediation goals
QAS	Quality Analytical Services
RAGS	Risk Assessment Guidance for Superfund
RBTLs	Risk-Based Target Levels
RCRA	Resource Conservation and Recovery Act
RFI	RCRA Facilities Investigation
SLs	Screening Levels

SLERA	Screening Level Ecological Risk Assessment
SQGs	Sediment Quality Guidelines
TEC	Threshold Effects Concentration
UCL	Upper confidence limit
WQC	Water quality criteria

1.0 Introduction

Shaw Environmental, Inc. (Shaw) has prepared this Human Health and Screening Level Ecological Risk Assessment (HHRA/SLERA) for the Quality Analytical Services (QAS) property located at 1633 Marsh Avenue, Blue Summit, Missouri (site). A Site Location Map is provided as **Figure 1**.

This assessment was conducted in accordance with applicable Environmental Protection Agency (EPA) guidance documents (USEPA, 1989, 1997, 2001, 2004). The main references include EPA's Risk Assessment Guidance for Superfund (RAGS) documents, EPA Soil Screening Level guidances, and recent Superfund and Resource Conservation and Recovery Act (RCRA) memorandums on the subject.

This HHRA/SLERA report also incorporates comments received from U.S. EPA Region 7 (April 17, 2006) and Missouri Department of Natural Resources (MDNR, June 29, 2006). Specific responses to agency comments are included as an attachment to the cover letter for this report.

Several site investigations, remedial activities and on-going monitoring activities have been conducted at the site. As such, the MDNR has received various reports regarding the site characterization and groundwater monitoring. Previously-submitted data is summarized in this HHRA/SLERA report. It should be noted that there are ongoing groundwater treatment and monitoring activities on site to address and remediate residual groundwater impacts associated with former source area materials.

The main components of the report are as follows:

- Site-Specific Information in Section 2, which summarizes the site location, history and land use;
- Summary of Comprehensive Site Investigation Findings in Section 3, which summarizes the findings of previous site investigations;
- Human Health Risk Assessment in Section 4, which describes the data evaluation, conceptual site model, exposure models, toxicity assessment and risk characterization;
- Screening Level Ecological Risk Assessment in Section 5, which discusses potential ecological hazards; and
- Summary and Conclusions in Section 6.

A reference section is provided in Section 7.

2.0 Site Description and Land Use

The QAS property, consisting of a 1.5-acre former used-oil collection and recycling business, is located at 1633 Marsh Avenue, in Blue Summit, Jackson County, Missouri (**Figure 1**). The site was originally operated as a used oil collection and recycling business under the name Radium Petroleum beginning in 1958. Deffenbaugh Industries, Inc. (Deffenbaugh) acquired the property in 1974, and changed the name to Industrial Service Corporation in 1988. The official site name as listed with MDNR is Quality Analytical Services (QAS). The property is no longer active and has gone through various remedial activities since 2000, including the following:

- an interim soil removal action to remove impacted soil associated with the former tank farm,
- installation of a composite cover system over the excavated area,
- the installation of a groundwater interceptor trench, and
- the installation of a groundwater treatment system.

2.1 Current Land Use

The QAS property is currently a non-active industrial property consisting of a 3,500-square foot two-story, slab-on-grade, building and adjacent land. Access to the site is restricted by a chain-link fence. Properties immediately surrounding the QAS site are vacant with no structures. The QAS site backs to a limestone outcropping that is approximately 50 to 75 feet high, and forms the bluff east of the subject site. This land is undeveloped and wooded. A former landfill is located beyond the vacant properties to the north and east of the site (**Figure 2**).

The property adjacent to the north is a grassy, vacant parcel owned by Deffenbaugh. Beyond the Deffenbaugh-owned property is property that is used for commercial business.

To the south, immediately adjacent to the QAS site, is a non-developed industrial/commercial property used as a parking lot and for the storage of trash dumpsters. The adjacent southern property is owned by Deffenbaugh. Beyond the dumpster storage yard/parking lot to the south are properties containing two mobile homes with addresses of 1715 and 1811 Ashland Drive. These are the nearest residential properties to the site, located approximately 300 feet from the south boundary of the site. Potable water for these mobile homes is obtained from the City of Independence. The nearest well, EPA-R-3 located within 50 feet of the nearest mobile home to the site and has had non-detect results. Land to the south is largely undeveloped for

approximately ½ mile. Approximately ½ mile south of the site is a small residential area at 22nd Street and Ashland Drive.

To the west of the QAS site, across Marsh Avenue, is the former Livers Bronze Co. property, which is currently vacant, undeveloped commercial/industrial property, also owned by Deffenbaugh. Access to this property is restricted by a fence. Beyond the vacant property is Interstate Highway 435 (I-435). West of I-435 is vacant land and an oxbow of the Blue River. The oxbow was created as a result of the U.S. Army Corps of Engineers flood control project that re-routed the flow of the Blue River. The oxbow is the former river channel, although it has been highly modified and now serves primarily as a detention basin. Land between the oxbow and I-435 is vacant and not available for development, as it is part of the interstate highway system. Land west of the oxbow is occupied by several automobile salvage yards and a non-operational grain elevator. West of the automobile salvage yards and grain elevator is Manchester Trafficway and the Blue River.

Currently, potable water, sanitary sewer service, telephone, and electrical services are available at the QAS site. Sewer services are provided by the City of Kansas City, Missouri. In general, residential areas west of the Blue River and south of the QAS site include single-family homes not exceeding 2,000 square feet. A water well search from the Missouri Geological Survey and Resource Assessment Division using a 1-mile search radius for Public Supply Wells and a ¼-mile search radius for private water wells was conducted. The results of the water well search indicated no private water wells within the one-mile radius. See **Figure 3** for results of the water well search and **Appendix A** for the complete search records.

Potable water is supplied by the City of Independence, which obtains water from the Missouri River Alluvial Aquifer. Thirty-eight supply wells, which were drilled from 75 to 135 feet below ground surface (bgs) with an average depth to groundwater of 25 feet, are located north and south of the Missouri River at the Courtney Bend Water Treatment Plant. The facility was constructed in 1954 and services 250,000 customers. The City is able to supply 42 million gallons per day (MGD) of treated water with an average demand of 27 MGD. The Courtney Bend facility and well field is located approximately 7 miles northeast of the Site. The City of Independence serves all areas with potable water east of I-435 in the vicinity of Blue Summit, Missouri. The City of Kansas City, Missouri, provides potable water to all businesses and residents west of I-435.

2.2 Future Land Use

Future land use at and near the site is expected to remain commercial/industrial. The area is zoned for such land use. The probability that groundwater could be used as a future source of water for domestic consumption was evaluated based on consideration of the following factors:

1. Current groundwater use patterns in the vicinity of the site under evaluation,
2. Suitability of use [e.g., total dissolved solids (TDS), yield, water quality],
3. Availability of alternative water supplies,
4. Activity and Use Limitations (AULs),
5. Urban development considerations for sites in areas:
 - a. of intensive historic industrial/commercial activity,
 - b. located within metropolitan areas with a population of at least 70,000 in 1970, and
 - c. with groundwater zones in hydraulic communication with such industrial/commercial surface activity.

2.2.1 Current Groundwater Use

Groundwater is not used for domestic purposes near the site. Potable water is supplied by the City of Kansas City and the City of Independence water supplies within, and beyond, a one-mile radius of the site.

2.2.2 Suitability

Depth to groundwater on site averages 15 feet bgs. There is a shallow silty aquifer (A zone) and a deeper sandy aquifer (B zone) at the site. The deeper of the two zones (B zone) is the alluvial sand aquifer, and it has sufficient capacity for potable use. Bedrock depth ranges from 0 to 74 feet bgs with bedrock outcropping to the east of the site as limestone bluffs. There is a slightly cemented, fine-grained sand encountered at approximately 40 to 50 feet bgs, which acts locally as an aquitard (C zone). This aquitard, referred to as the C-zone, has not been encountered east of Marsh Avenue.

Volatile organic compounds and inorganic compounds have been detected in groundwater samples from the A, B, and C zones. Specific conductivity was measured and can be related to TDS. Based on Shaw's experience with sites with alluvial aquifers in the Kansas City area, specific conductivity is related to TDS by the following relationship:

$$\text{TDS (mg/L)} = 0.4 \times \text{specific conductivity (}\mu\text{S/cm)}$$

Concentrations of naturally-occurring iron and manganese in groundwater samples collected from all three aquifers at the site exceeded EPA Secondary Drinking Water Standards (SDWS) of 0.3 mg/L and 0.05 mg/L, respectively (USEPA, 2006). The SDWS for TDS is 500 mg/L.

In wells on site and within Deffenbaugh-owned properties; four of six samples collected from the A zone exceeded the TDS standard; three of four samples collected from the B zone exceeded the TDS standard; and one of two samples collected from the C zone exceeded the TDS standard. Nitrate (as nitrogen) and sulfate concentrations in site groundwater were less than the SDWS. Since the TDS and the concentrations of iron and manganese in site groundwater exceed the SDWS, it is unlikely that the site aquifers are a useable source of potable water.

2.2.3 *Availability of Alternative Water Supplies*

On-site and off-site groundwater is supplied by local municipalities. See Section 2.1 above for description of local municipal groundwater supplies.

2.2.4 *Activity and Use Limitations (AULs)*

A Land Use Restriction for the QAS site was filed with the Jackson County Recorder of Deeds in accordance with 10 CSR 25-7.265, effective since January 30, 1999. Formal notification of the restrictive land use was also filed with MDNR and USEPA Region 7. The Land Use Restriction includes the engineered cap area. A copy of the land restriction document is included as **Appendix J**.

2.2.5 *Urban Development*

As described above, the site and surrounding area consists of current and historic industrial/commercial activity, and is located in a densely populated metropolitan area of Jackson County (according to the Census Bureau, population in 1970 was 654,000). Future land use on site is expected to remain industrial or commercial. Due to the current zoning, urbanization and long-term industrial land use of the surrounding area, off-site land is likely to continue to be industrial and commercial.

2.3 *Summary of Potential On-Site Groundwater Use as Potable Water*

Currently, the site and immediate surrounding area is zoned for commercial and light industrial (warehousing) use. Per discussion with Mr. Randy Diehl, Planner for Unincorporated Jackson County (816-881-4577), the closest area zoned for residential use is 600 feet southeast of the southern site boundary. Groundwater is not used as a potable source on-site or in the area; as local municipalities supply potable water to the area. Results of groundwater quality testing further suggest that groundwater is not of suitable quality for use as a potable source. Based upon the above factors, impacted groundwater is not likely to be used as a future source of water for domestic purposes or consumption. The groundwater pathway is further evaluated in Section 4.

3.0 *Summary of Comprehensive Investigation Findings*

The site has been the subject of environmental investigations beginning in 1986, with an assessment conducted by EPA. MDNR has administered further investigations and monitoring for the QAS site. The QAS site is an interim status facility, and has never had a Resource Conservation and Recovery Act (RCRA) permit. In 1994, QAS and EPA entered into an Administrative Order on Consent (AOC) for Corrective Action. The AOC established the procedures to be followed in order to complete a RCRA Facilities Investigation (RFI) to assess the extent of contamination and to prepare a Corrective Measures Study (CMS) to determine the most appropriate corrective action to be implemented for site remediation.

The receipt of used oil and process operations ceased at this site in 1996. Tanks and process equipment were dismantled and disposed of under MDNR oversight in 1998.

3.1 *Soil and Groundwater Investigation Summary*

Site-specific background concentrations have not been established for metals for either groundwater or soil. Soil and groundwater data generated from investigations provide spatially and vertically representative data for all constituents detected at the site. The investigations have generated accurate data to define the detected constituents in soils and groundwater.

The detected constituents in soil consist of two aromatic hydrocarbons, three chlorinated volatile organic compounds (VOCs), one semi-volatile organic compound (SVOC) and 16 metals. Secondary soil sources that could potentially impact groundwater are not apparent when a comparison of detected constituents in soil and groundwater is made. In general, detected constituents in groundwater include aromatic hydrocarbons, chlorinated VOCs, 1,4-dioxane, methyl tert-butyl ether (MTBE) and ten metals.

Based on the site investigation conducted since 1986, 114 borings have been advanced both on site and off site at the facility. Of these 114 borings, 77 were plugged on completion, 33 were constructed as monitoring wells, and 4 were completed as extraction wells. Nine of the monitoring wells were later plugged and abandoned. The remaining 24 wells are utilized in a Post-Closure monitoring program.

3.2 *Closure Certification and Interim Measure Activities*

The primary source of site impact was the impacted soil beneath the former used oil aboveground storage tank (AST) farm. In 2000, impacted soil and concrete beneath the former

tank farm was excavated and transported off site for disposal. Soil Closure samples were collected from the excavated area (walls and floor) and analyzed for VOCs, SVOCs, pesticides/PCBs, herbicides and metals. All data was submitted with the Closure Certification Report. A composite geosynthetic cover system was installed over the backfilled excavation and the area immediately surrounding it. Closure Certification was accepted by the MDNR on January 25, 2002; the facility is now in compliance with the requirements of the approved Post-Closure Plan dated June 2002.

An interceptor trench was installed as part of these activities, as an interim measure (IM) of the AOC, for the purpose of extracting light non-aqueous phase liquid (LNAPL) that was observed in monitoring wells along Marsh Avenue. Operation of the groundwater interceptor trench has not been successful in recovering all of the LNAPL from the impacted area. LNAPL is present in wells GW-3, GW-4, and EPA-R-1. LNAPL was also present in well GW-2 prior to excavation activities, but is no longer observed at a measurable quantity in replacement well GW-2R. Micro-purge sampling equipment has been installed at these four locations in order to obtain representative groundwater samples since September 2000. Refer to **Figure 2** for the Site Base Map and location of the monitoring wells.

The IM was modified in June 2002 by the addition of two groundwater extraction wells, PW-1 and PW-2, and in May 2003 by the addition of groundwater extraction wells PW-3 and PW-4 near the downgradient edge of the contaminant plume. Groundwater is extracted from the extraction wells and an interceptor trench installed beneath a former used oil facility and pumped to a 1,500-gallon polyethylene holding tank. The tank automatically discharges to two adsorber units filled with activated carbon treatment media and then to the sanitary sewer. The treated water is filtered by a 40-mesh Y strainer, and total discharge is monitored by a water meter prior to discharge. Flow volume is dependant on groundwater yield, which averages approximately 10,500 gallons per day (gpd). The system is fully automatic and operates continuously. This discharge is monitored under a permit administered by the City of Kansas City, Missouri. The IM is subject to on-going monitoring.

With closure of this site, post-closure use of the property may involve commercial and/or light industrial use of the building and areas of the property not impacted by the closure or post-closure infrastructure at the site.

3.3 Site Geology

The QAS site is situated on the eastern edge of a terrace above the Blue River flood plain, approximately 700 feet east of the river. Bedrock is exposed in a cliff, which is cut into the bluff

forming the facility's eastern boundary. The topography is relatively level in the vicinity of the site, and slopes gently to the west. Immediately west of the site is a sharp drop in elevation marking the edge of terrace deposits.

Most of the site is underlain by one to two feet of gravel or other anthropogenic materials. Underlying the fill material are soils belonging to the Snead-Menfro-Oska association, formed in loess or residuum from shale and limestone. Below the fill and surface soils, boring logs are highly variable. Generally, the first unit (Zone A) encountered is a silty clay containing a moderate density of plant root cavities. This unit is probably associated with loess deposits. Below this unit, as observed in deeper borings, there appears to be a coarsening downward sequence beginning with silty clay, to clayey silt, to a variable fine- to coarse-grained sand, and finally to a sand and gravel layer (B zone) encountered overlying the bedrock. Although the sequence is laterally variable, there is evidence suggesting that the units thicken to the west as depths to bedrock increase. The B zone appears to be alluvial in origin.

It has been noted that in the vicinity of monitoring well nests GW-8, GW-9, GW-10, GW-11, and GW-12, there is a slightly cemented, very-fine-grained sand (C zone). This sand is encountered at a depth of 40-50 feet bgs and, where present, directly overlies the B zone. This sand acts locally as an aquitard.

The bedrock consists of interbedded limestone and shale units of Pennsylvanian age. It outcrops at monitoring well GW-1 and lies at a depth of 75 feet in monitoring well GW-10B, over a lateral distance of 370 feet.

3.4 Site Hydrogeology

Prior to 1997, the Blue River was located approximately 625 feet west of the QAS facility. In 1997, the Corp of Engineers relocated the Blue River farther west of the facility leaving an oxbow between the site and the Blue River. QAS is located within the drainage of the Blue River, and is approximately 3.5 miles south of the confluence of the Blue and Missouri Rivers. Under natural conditions, the groundwater flow direction generally follows the topographic surface. As such, groundwater from the site flows from east to west toward the low lying area of the oxbow. Average depth to groundwater is 15 feet bgs.

Three groundwater horizons have been identified: silts and clays overlay an intermediate fine-grained, semi-consolidated sand layer, which overlays a deeper gravel horizon. These hydrogeologic units are referred to as Zones A, C, and B, respectively. The three zones are not hydraulically connected based on 1) different hydraulic gradients within each zone, 2) different

responses of each aquifer to recharge from precipitation, 3) concentrations of chemical constituents in groundwater, and 4) the response of the water level in each zone when the pumps were turned off for a few days in November 2006. As noted above, the semi-consolidated sand layer (C-zone) has not been encountered east of the nested GW-11 wells and thus, not encountered within the QAS property boundary.

The meander of the Blue River that was abandoned by the Corps of Engineers (the “oxbow”) currently serves as a detention and flood control area for overflow from the current Blue River channel and for surface runoff, with stone riprap lining the banks, and concrete barriers in the channel to slow any potential flow of water within the abandoned channel. The Blue River channel was cut into the shallow A zone aquifer, which begins immediately below ground surface. The oxbow is incised into the A zone aquifer to a depth of approximately 20 feet. The current Blue River channel was cut to a depth of approximately 25 feet into the A zone aquifer.

The pumping system at the site was out of service from November 15 to November 21, 2006. Deffenbaugh personnel measured water levels in site wells during the system shutdown to help determine what water table conditions would be if the system were shut off. The following table illustrates the differences in hydraulic gradients for pumping and non-pumping scenarios by groundwater zone.

Zone	Condition	Hydraulic Gradient
A	Pumping	0.045
	Non-pumping	0.045
C	Pumping	0.018
	Non-pumping	0.025
B	Pumping	0.051
	Non-pumping	0.047

The hydraulic gradient for the C zone is approximately half of the hydraulic gradient for the B zone. Although these two units are in contact with each other, each behaves as a separate hydrogeologic unit. The C zone appears to be a separate point bar and channel sequence overlying the B zone. Hydrographs of wells GW-11B and GW-11C show different responses to precipitation events in the two wells, with the B zone responding more than the C zone to recharge from precipitation. The concentrations of chemical constituents in groundwater are different enough in the B and C zones to suggest that there is not a hydraulic connection between the two aquifers. In the course of a November 2000 push probe investigation of the former

Livers Bronze Facility (off-site to the west), the significant and consistent decrease in drilling speeds between the A and C zones suggests that there is not likely to be a hydraulic connection between the two zones.

3.5 Nature and Extent Characterization

3.5.1 Soil

As discussed in Section 3.2, the primary source area was impacted soils beneath the former used oil AST farm. Impacted soil and concrete were excavated and transported off-site for disposal in 2000. Confirmation soil sampling was conducted and the excavation backfilled. A geosynthetic cap was installed over the area, and closure was granted by MDNR in June 2002.

Residual constituents detected in soils included aromatic hydrocarbons, chlorinated VOCs, SVOCs, pesticides/PCBs, and ten metals. The majority of these constituents were detected near detection levels. A summary of the soils data are provided in **Tables 3-1** through **3-4**, and sample locations are provided on **Figure 4**. Laboratory reports are provided in **Appendix B**.

Soil samples collected in 1995 from soil borings SB-1, SB-2, SB-3, and SB-4 located in the northeast corner of the parking lot (off-site) did not indicate that subsurface soils in this area had been impacted by on-site contaminants. Chemical analysis of these samples indicated non-detects for the targeted analytes. Delineation of the impacted area is represented on **Figure 2** as Off-Site Area 1.

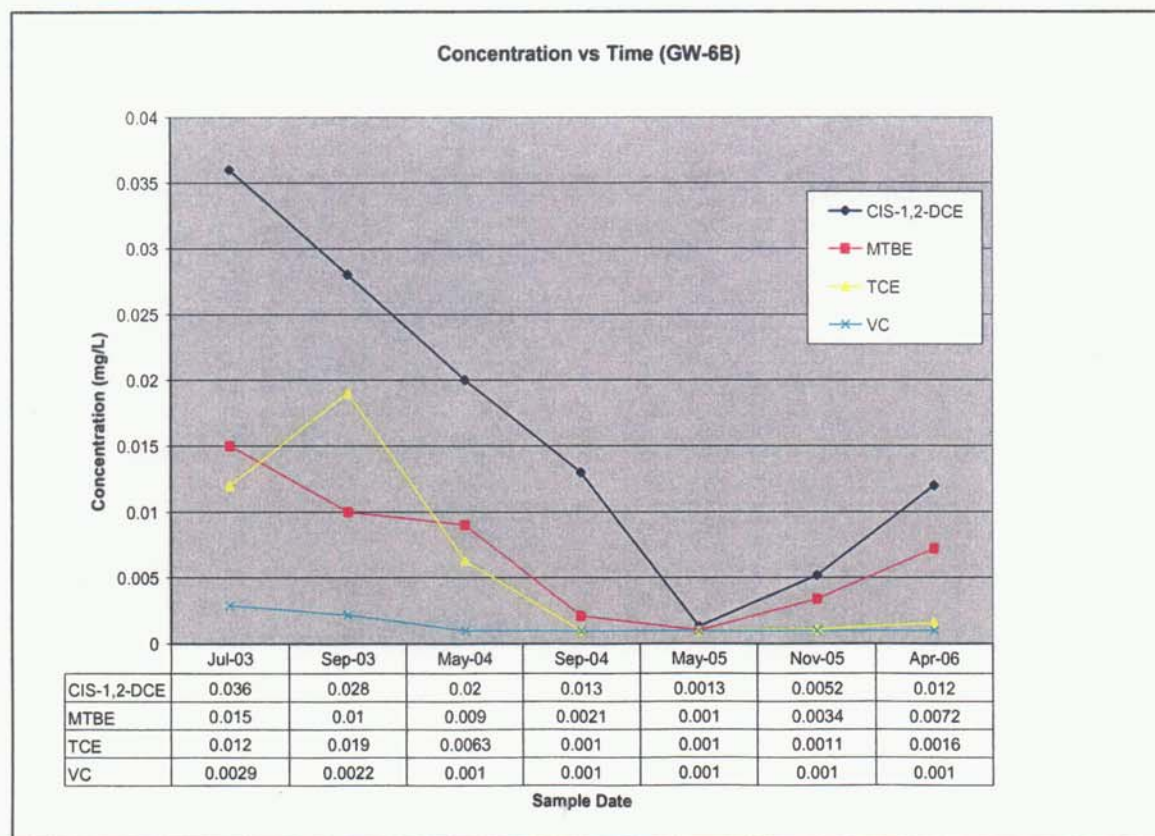
3.5.2 Groundwater

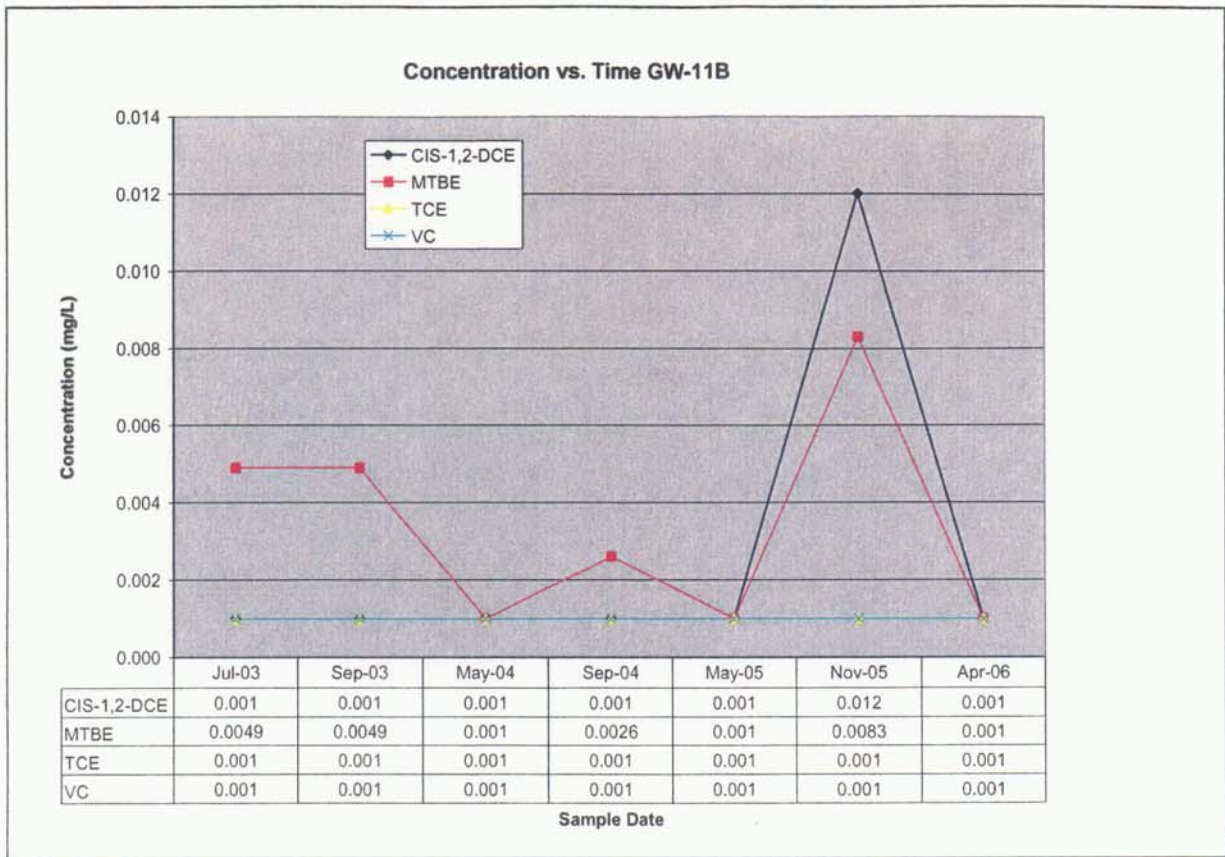
Well locations are shown on **Figure 2**. Monitoring wells GW-1 and GW-2R are screened in the bedrock. Monitoring wells GW-6A, EPA-R1, and GW-11A are screened in the "A" zone. Monitoring well GW-11C is screened in the "C" zone; encountered to the west of the site, overlying a deeper "B" zone. Monitoring wells GW-6B and GW-11B are screened in the "B" zone. Pumping wells PW-1, PW-2, PW-3, and PW-4 are screened across all three zones. Wells GW-3, GW-4, and EPA-R-3 are installed near the contact with bedrock and may be more closely associated with the B-zone. Wells GW-5 and GW-7 were installed in silty clay with no mention of contacting bedrock and may be in the A-zone (although it is likely they were near the contact).

LNAPL is present in wells GW-3, GW-4, and EPA-R-1. LNAPL was also present in well GW-2 prior to excavation activities, but is no longer observed at a measurable quantity in replacement well GW-2R. Micro-purge sampling results of the LNAPL wells from November 2006 indicated the presence of the following constituents: arsenic, benzene, butylbenzenes, cadmium, chlorobenzene, chromium, dichlorobenzenes, 1,4-dioxane, ethyl benzene, isopropylbenzene,

methyl tert-butyl ether (MTBE), naphthalene, tetrachloroethene, toluene, trichloroethene, 1,2,4-trimethylbenzene, 1,3,5-trimethylbenzene, and total xylenes. Of those constituents detected in the November 2006 micro-purge samples, arsenic, benzene, chlorobenzene, 1,4-dichlorobenzene, 1,4-dioxane, naphthalene, tetrachloroethene, trichloroethene, 1,2,4-trimethylbenzene, 1,3,5-trimethylbenzene, and total xylenes are present at concentrations exceeding the EPA Region 9 Preliminary Remediation Goals (PRGs) for Tapwater. Benzene is present at concentrations exceeding the PRG in monitoring wells EPA-R-1, GW-3, and GW-4. PCE and TCE are present at concentrations exceeding PRG in monitoring well EPA-R-1, and 1,4-dioxane is present at concentrations exceeding the PRG in monitoring well GW-3.

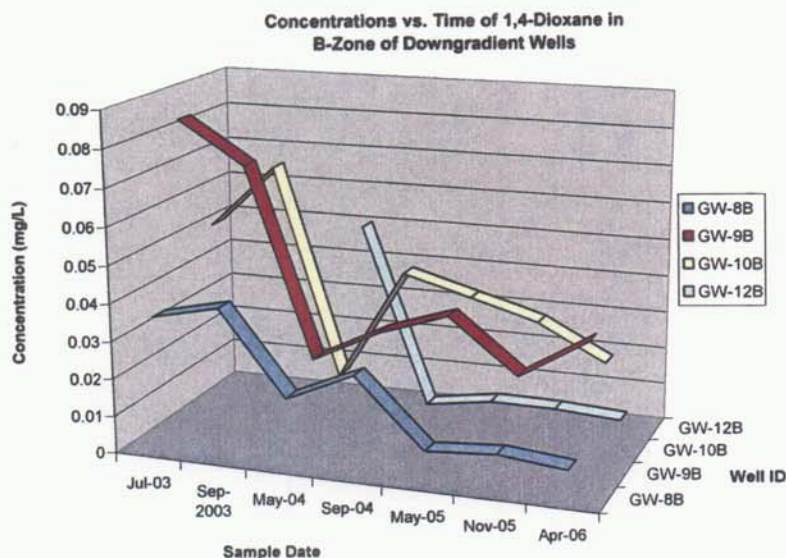
A number of metals and volatile organic chemicals have been detected in the dissolved phase in groundwater beneath the On-site Area, as well as in portions of Off-site Areas. Summary of groundwater data since July 2003 is provided in **Appendix C**. Since the installation of the groundwater extraction system, there has been a general downward trend in concentrations. The charts below depict concentrations over time for wells GW-6B and GW-11B for selected VOCs, which are within the zone of influence of the remediation system.





Concentrations over time of 1,4-dioxane in the downgradient wells screened in the B-zone are depicted in the chart below. As indicated in the chart, there is a general downward trend of 1,4-dioxane concentrations in the deeper aquifer wells¹.

¹ Please note that for all charts, non-detects were plotted using the detection limit.



3.5.3 Surface Water and Sediment

On September 8, 2004, Shaw Environmental mobilized to the site to collect surface sediment and surface water samples. The constituents of concern were VOCs, 1,4-dioxane, and metals. The samples were collected from the oxbow of the Blue River, located approximately 700 feet west of the facility on the west side of Interstate Highway 435. The oxbow is the closest downgradient surface water receptor (possible point of exposure) to the site.

Ten sediment and ten surface water samples (OX-1 through OX-10) were collected at co-located sites within the oxbow (see **Figure 5**). In addition, upstream and downstream surface water samples were collected from the Blue River, BRU-1 and BRD-1, respectively. One duplicate sample, one field blank, and two trip blanks (one for EPA Method 8260B and one for EPA Method 1625M) were collected for quality assurance/quality control purposes. Surface water samples were analyzed for volatile organic compounds utilizing EPA Method 8260B, 1,4-dioxane using EPA Method 1625M, and total and dissolved metals using EPA Method 6010B. Sediment samples were analyzed for volatile organic compounds utilizing EPA Method 8260B, 1,4-dioxane using EPA Method 1625M, and total metals using EPA Method 6010B. All samples were collected in accordance with Shaw's SOPs for surface water and sediment sampling.

Since the water in the oxbow was very shallow (less than 2 feet) when the samples were collected, grab samples were collected from the ten locations (OX-1 through OX-10). The depth to water was measured at several points along transects, and flow was measured to determine the mass flux through various parts of the oxbow. Measured flow within the oxbow was generally slow, ranging from no flow to 0.3 feet/second.

No VOCs were detected in surface water or sediment samples. Metals were detected in both surface water and sediments. The total metals results in surface water are summarized in **Table 3-5**, and the metals results in sediments are summarized in **Table 3-6**. Metals concentrations in the oxbow samples appear to be consistent with upstream samples, suggesting that the sediments and surface water of the oxbow are not impacted by chemicals released from the site.

- There were no detectable concentrations of VOCs in surface water or sediment samples collected from the oxbow. VOCs are primary constituents of potential concern (COPCs) in the site groundwater and soil.
- Metals detected in the surface water include barium, manganese, and selenium. Manganese is the only one of these that is also a groundwater COPC, and concentrations of manganese in surface water are less than the U. S. EPA Region 9 Tap Water PRG.
- Metals detected in the sediment samples include mercury, arsenic, barium, cadmium, chromium, lead, manganese, nickel, and selenium. Arsenic, cadmium, lead, and manganese are also groundwater COPCs. The only metal present in sediments whose concentration in sediment exceeds the U.S. EPA Region 9 PRG for direct contact at industrial sites is arsenic. Arsenic concentrations in the sediment are two orders of magnitude greater than the calculated source concentration in groundwater. It is unlikely that the arsenic present in the oxbow sediments originated from the site.

It is most likely that the metals detected in the sediments and surface water of the oxbow are either naturally-occurring or originated from runoff from other non-site related sources.

4.0 Human Health Risk Assessment

The purpose of this risk assessment is to provide a quantitative and qualitative analysis, in a conservative and health-protective manner, of adverse human health effects that may be associated with potential exposures to site-related COPCs. In providing health-related information on potential human exposure to site-associated constituents, this risk assessment is designed to provide a sound basis for risk management decisions.

The risk assessment was conducted using a tiered approach. The tiered process consisted of initially conducting a risk-based screening evaluation of data using applicable or appropriate standards or available risk-based cleanup goals. If the maximum detected concentration (MDC) of an individual constituent did not exceed the corresponding screening level, additional evaluation was considered unnecessary. However, if a generic screening level was exceeded by the constituent MDC, then that constituent was included in additional risk-based evaluations.

The HHRA includes the following components:

- Data Evaluation and Compilation
- Exposure Assessment
- Toxicity Assessment
- Risk Characterization
- Uncertainty Analysis

4.1 Data Evaluation and Compilation

Relevant soil, groundwater sediment, and surface water data collected from the site was evaluated for use in the baseline risk assessment. This involved identification of all data available from the site and affected off-site areas. Analytical results were compiled and subjected to a statistical summarization and screened using various criteria, described in the following subsections, to select COPCs for evaluation in the HHRA.

All data was qualified by the laboratories and also validated. Results with J-qualified data, indicating estimated concentrations, were used in the screening and risk analysis. Data qualified as Rejected (R), due to quality control limits, were not used in the evaluation.

4.1.1 Soil Data

Soil samples were collected from 19 locations (B-1 through B-19) during site characterization activities in 1997, 1998, and 2000 (**Figure 4**). Samples from multiple depth intervals were selected for analysis of VOCs, SVOCs, pesticides, polychlorinated biphenyls (PCBs), and toxic

metals. The August of 2000 sample event was conducted only for borings B17 to B19 to re-sample for SVOCs and PCBs. Laboratory data has been previously submitted to MDNR and EPA. The laboratory reports for data used in the HHRA are provided in **Appendix B**.

Sample locations B1 through B13 were located south of the QAS site, in or near the adjacent parking area currently owned by Deffenbaugh. Sample locations B14, B15 and B16 were located on the northern parcel of the QAS site also owned by Deffenbaugh, along the drainage ditch adjacent to Marsh Avenue. Sample locations B17, B18, and B19 were located within the QAS site building, and are the only on-site soil sampling locations.

4.1.2 Groundwater Data

The current groundwater extraction system is capturing the greatest concentrations of on-site groundwater contamination. Monitoring data indicates that the system is effectively preventing migration of LNAPL and the most-impacted groundwater. Groundwater-related exposures were assessed under two separate assumptions: 1) Current and future land use with the extraction system on, and 2) future land use with the extraction system off. A summary of the groundwater analytical data used in the current and future exposure scenarios with the extraction system operating is provided in **Appendix C**. For the future extraction system off scenario, the 95% upper confidence level groundwater concentration was calculated, and used as the representative on-site groundwater concentrations (**Appendix G** and **Table 4-12**).

For the operational extraction system scenario, available groundwater data from post-June 2003 monitoring events (July 2003, September 2003, May 2004, September 2004, May 2005, November 2005, and April 2006) were used to represent current and probable future conditions. These data were selected because two additional pumping wells (PW-3 and PW-4) were installed in June 2003. Sampling events between the installation of the additional pumping wells in June 2003 and December 2003 were limited in the number of monitoring wells and/or the parameter list while the remediation system was stabilizing. Only data from monitoring wells were used; data from the influent and effluent trench, and pumping/recovery wells were not used in the risk assessment. Data from samples collected from monitoring wells identified as having product (EPA-R1, GW-2R, GW-3, and GW-4), were also not included in the assessment of the operational extraction system scenario, because these product-containing wells are within the capture zone of the active groundwater extraction system.

Groundwater samples were collected from 19 monitoring wells, although not all wells were sampled during every event. Groundwater samples were analyzed for VOCs using EPA Method 8260, total toxic metals using Method 6010, and mercury using Method 7470.

Additionally, groundwater samples from the September 2004 event were submitted to Zymax Laboratory, and from the May 2005 event to Weck Laboratory for the low level analysis (Method 8270c) of 1,4-dioxane. Since the results from these laboratories had lower detection limits, the Zymax and Weck data were used in the overall data set. A full data set of toxic metals was available from the December 2003 event and was included in the HHRA.

Monitoring wells GW-1, GW-2R and GW-4 are located within the QAS site boundary. GW-3 and EPA-R-1 are located west of the site: GW-3 is just outside the geosynthetic cap boundary, along the Marsh Avenue right-of-way and EPA-R-1 is across Marsh Avenue, approximately 50 feet west of the site. GW-5 is located approximately 80 feet north of the site, and GW-7 and EPA-R-3 are located approximately 30 feet and 375 feet, respectively, to the south of the site. Wells 6A, 6B, and the nested wells GW-11 (A,C,B) are located on the adjacent property west of Marsh Avenue. These wells are all located on industrial/commercial property owned by Deffenbaugh. The remaining wells evaluated in the risk assessment, nested wells GW-8 (A,C,B), GW-9 (A,B), GW-10 (A,C,B), and GW-12 (A,C,B), are located west and downgradient of the groundwater remediation system, with the GW-12 cluster being the furthest downgradient wells (**Figure 2**).

4.1.3 *Surface Water and Sediment Data*

Ten sediment and ten surface water samples were collected at co-located sites within the oxbow in September 2004. In addition, upstream and downstream surface water samples were collected from the Blue River (**Figure 5**). Surface water samples were analyzed for VOCs utilizing EPA Method 8260B, 1,4-dioxane using EPA Method 1625M, and total and dissolved toxic metals using EPA Method 6010B. Sediment samples were analyzed for VOCs utilizing EPA Method 8260B, 1,4-dioxane using EPA Method 1625M, and total toxic metals using EPA Method 6010B. Laboratory data for the oxbow surface water and sediment sampling is provided in **Appendix D**.

4.2 *Exposure Assessment*

Complete or potentially complete exposure pathways under both current and future land use conditions are quantitatively evaluated in an HHRA. For an exposure pathway to be considered complete, it must be possible for a constituent to be transported via an environmental medium to a potential receptor location, and for receptors to be in contact with the constituent and assimilate it into their bodies via ingestion, inhalation, or dermal contact.

A complete exposure pathway consists of the following elements:

- A contaminant source and release medium;
- A retention or transport medium;
- An exposure point where human receptors are in contact with the contaminated medium; and
- An exposure route at the exposure point.

If any of these elements do not exist and will not exist in the future, the exposure pathway is considered incomplete and further evaluation is not required. In some instances, a complete or potentially complete exposure pathway may be considered a minor or insignificant pathway, meaning the pathway is not expected to contribute significantly to the overall exposure and risk.

4.2.1 Conceptual Site Model

The Conceptual Site Model (CSM) for this HHRA evaluated potential exposure pathways associated with soil, groundwater and surface water media. The QAS site and surrounding properties are currently used for industrial or commercial land uses or are vacant. For purposes of the risk assessment, the site has been divided into the following exposure areas, which are depicted on **Figure 2**:

1. On-Site consists of the on-site building and engineered cap area within the QAS property boundary (consisting of borings B17-B19 and well GW-1);
2. Off-Site Area 1 includes the adjacent properties to the north, west, and south owned by Deffenbaugh and the groundwater remediation area, represented by borings B1 through 16, and wells GW-5, GW-6 (A,B), GW-7, GW-11 (A,C,B), and EPA-R3; and
3. Off-Site Area 2 includes the remaining surrounding area and groundwater downgradient of the remediation system; represented by wells GW-8 (A,C,B), GW-9 (A,B), GW-10 (A,C,B), and GW-12 (A,C,B). There are no soil samples/results associated with Off-Site Area 2, since impacted soils were only present within the on-site area and immediately adjacent property.

The CSM presents exposure media, exposure points, receptor populations, and exposure routes evaluated in the HHRA. The conceptual site model was developed based on the following site conditions and assumptions:

- Primary source soils have been removed, and only secondary sources of groundwater impact remain (i.e., LNAPL presence in wells GW-3, GW-4, EPA-R1, and historically GW-2R);

- The site is currently zoned for industrial land use, and future land use will remain industrial or commercial;
- The groundwater extraction system is currently controlling groundwater on-site and preventing further downgradient migration of impacted groundwater;
- While the extraction system is in operation, only groundwater downgradient from the current extraction system zone of influence could potentially reach exposure points off-site (i.e., Off-Site Area 2);
- The nearest surface water body is the oxbow of the Blue River;
- There is no direct evidence that impacted groundwater at the site is hydrologically connected to the oxbow or the Blue River, based on comparison of chemical constituents and concentrations in the groundwater and in the surface water bodies;
- Groundwater flow follows the topography in the area; thus without the pumping system on, groundwater from on-site would flow west toward the low lying oxbow; and
- There is currently no known point of direct exposure with impacted groundwater.

4.2.2 Exposure Pathway Analysis

The exposure pathway analysis is summarized in **Table 4-1**. The identification of potentially exposed populations is based on the current and proposed future land use at the QAS site, which is industrial with restricted site access. Current land use at the site is industrial; and downgradient of the site, land use is roadway (I-435) and vacant land. Based on a water well search, there are no groundwater wells for public supply, domestic or industrial use within a one-mile radius of the site. Since the current channel and the oxbow are incised into the A zone, there is a potential for deeper groundwater (e.g., the B zone) to flow beneath the existing river channel. However, the groundwater does not appear to be a viable potable water source based on secondary drinking water standards.

The identified populations with potential exposures to impacted media include the following:

- On-Site: current and future on-site indoor and outdoor commercial/industrial (C/I) workers and construction workers;
- Off-Site Area 1: current and future off-site indoor and outdoor C/I workers and construction workers;
- Off-Site Area 2: current or future off-site residents, indoor and outdoor C/I workers, and off-site recreational users encountering direct contact with surface water at the oxbow.

Each element of the exposure pathway analysis is described in the subsequent sections. In addition, a summary for the exposure scenarios and characteristics evaluated in the HHRA is provided in the table below.

SUMMARY OF EXPOSURE SCENARIO CHARACTERISTICS AND PATHWAYS OF CONCERN QUALITY ANALYTICAL SERVICES SITE					
Scenario	Future Construction	Current/Future Commercial/ Industrial Land Use		Future Downgradient Areas	
Receptor	Construction Worker	Outdoor Worker	Indoor Worker	Off-site Resident	Off-site Recreational User
Exposure Area	Off-Site Area 1	Off-Site Area 1	Off-Site Area 1	Off-Site Area 2	Off-site - oxbow
Exposure Media	Subsurface soil (0-15 ft bgs)	Shallow subsurface soil (0-2 ft bgs)	Surface soil (0-1 ft bgs); Subsurface soil (0-15 ft bgs)	Off-Site Area 2 groundwater wells	Surface water
Exposure Characteristics	-Exposed during construction activities only -Short-term exposure -B14, B15, and B16	-Substantial soil exposures -Higher soil ingestion rate than indoor worker -B1 to B16	-Minimal soil exposures (no direct contact with outdoor soils) -B1 to B13	-Potential future resident downgradient from the site -Potentially complete pathway if volatile COPCs in site groundwater migrate to downgradient exposure point	-Intermittent, seasonal exposures to surface water during recreational use -Limited exposure since oxbow is very shallow and vegetated
Pathways of Concern	-Ingestion (surface and subsurface soil); -Dermal absorption (surface and subsurface soil) and -Inhalation (fugitive dust, outdoor vapors)	-Ingestion (surface and shallow sub-surface soils); -Dermal absorption (surface and shallow sub-surface soils); -Inhalation (fugitive dust, outdoor vapors)	-Ingestion of indoor dust from surface soils -Inhalation of volatiles in subsurface soil and groundwater migrating to indoor air	-Inhalation of volatiles in groundwater through the vapor intrusion pathway	-Incidental ingestion and dermal contact to COPCs in surface water

4.2.2.1 Soil

Impacted soils, the original source media at the site, were excavated and removed from the site in 2000, an engineered cap was installed, and a fence restricts access to the site. As discussed in Section 3.2, soil excavation samples were collected as part of the Closure Certification Process. Results of the 2000 exaction samples were submitted and closure was granted from the MDNR. The excavation samples were not included in this risk assessment due to the Closure Certification, synthetic cap and Land Use Restriction applicable to the area. Therefore, direct contact to on-site soils is not a complete pathway.

On-site subsurface soil samples were collected from borings B-17 through B-19, located beneath the QAS site building. These borings are the only sample locations within the On-Site Area that were included in the risk assessment. Since these borings are located beneath the building slab;

the current direct soil exposure pathway in this area is incomplete. In addition, only low levels of constituents were detected and not above screening levels; therefore, no complete pathways, current or future (assuming the building is raised), are present for on-site soils.

Soil exposure point concentrations for Off-Site Area 1 were represented by data from samples collected from boring locations B1 through B16. Areas of residual concentrations in soils from Off-Site Area 1 may become a direct contact exposure medium only if the soils are exposed. Land use within Off-Site Area 1 is likely to remain industrial. Thus, current/future indoor and outdoor C/I worker exposures to off-site soils were evaluated under a non-residential land use scenario. Soil representing potential exposure medium for the indoor worker scenario is assumed to be from the 0-1 foot bgs depth interval, and for the outdoor worker scenario is assumed to be from the 0-2 foot bgs depth interval.

A construction worker scenario for Off-Site Area 1 assumed that impacted soils would be exposed and contacted during construction or buried utility repair activities. Construction workers might be involved in excavation activities, such as digging building foundations or utility trench excavations and repair. Soil representing potential exposure medium under a future construction worker scenario is assumed to be from the 0-15 foot bgs depth interval. The most likely area potentially undergoing construction or utility repair activities is the right-of-way/drainage ditch along Marsh Avenue. Thus, construction worker exposure to surface and subsurface soil were evaluated using borings B14 to B16. These sample locations also exhibited the highest detected concentrations and represent a conservative approach.

No soil data was collected from areas that represent Off-Site Area 2, since residual soil concentrations have been delineated within On-Site and a few locations in Off-Site Area 1. Therefore, potential soil exposures associated with Off-Site Area 2 are not a complete pathway.

4.2.2.2 Groundwater

There is currently no potable or non-potable use of impacted groundwater at the site, which occurs at a depth of approximately 15 feet bgs. Since the depth to groundwater is approximately 15 feet, dermal contact with groundwater is not expected to occur under current or future land use evaluated in the HHRA. The groundwater is not expected to be a source of drinking water, and ingestion of groundwater is not expected to occur because municipal water and sewer services are available throughout the area. Furthermore, results of the water well search indicate there are no potable water wells within a one-mile radius of the site.

A separate on-site groundwater exposure area was not evaluated since no direct on-site groundwater exposure pathways are complete. Rather, on-site monitoring wells were included in

the exposure area for Off-Site Area 1. Potential groundwater pathways for Off-Site Area 1 (which includes the on-site monitoring wells) include potential inhalation exposures by indoor commercial/industrial workers to volatilized COPCs from groundwater. Potential groundwater pathways for Off-Site Area 2 (which includes the wells downgradient of the remediation system) include potential inhalation exposures by indoor commercial/industrial workers and off-site, downgradient residents to volatilized COPCs from groundwater.

4.2.2.3 Groundwater Without Extraction System Operation

LNAPL has been detected in wells GW-2R, GW-3, GW-4 and EPA-R1. There are no direct exposures to LNAPL in groundwater, and these wells are within the zone of influence of the groundwater extraction system. However, groundwater modeling was conducted to evaluate potential downgradient groundwater conditions assuming the groundwater extraction system was shut off.

The modeling was performed using a three-dimensional analytical transient groundwater contaminant transport model (Domenico 1987). The use of the Domenico fate and transport model was requested by EPA and MDNR. A detailed discussion and model outputs are provided in **Appendix G**.

4.2.2.4 Ambient and Indoor Air

The potential exists for migration of volatile constituents from groundwater to soil gas, which would then be available to migrate to ambient air and indoor air. Potential inhalation exposures to volatilized constituents in ambient air were evaluated using EPA risk assessment methodologies.

Potential indoor air exposures exist for commercial/industrial indoor workers in existing or potential future buildings on site or off site and residents in off-site homes. Potential indoor exposures to volatilized constituents were evaluated by comparing maximum groundwater concentrations to screening levels provided in the Draft Guidance for Evaluating the Vapor Intrusion to Indoor Air Pathway from Groundwater and Soils (USEPA, 2002).

Both generic and site-specific screening levels were used for comparison. The site-specific screening levels were based on adjustments for soil type and depth to groundwater. The predominant depth to groundwater is 15 feet bgs and soil lithology is silty clays. Thus, in accordance with the guidance, target groundwater concentrations were selected using a vapor attenuation factor of 1.0×10^{-4} . This attenuation factor is based on a groundwater depth of 15 feet and loam type soils.

4.2.2.5 Surface Water and Sediment

The nearest surface water body is an oxbow of the Blue River, which is located approximately 700 feet west of the QAS site. The oxbow is approximately 100 feet wide (east to west). Groundwater flows to the west, toward the oxbow and the Blue River. The main channel of the Blue River is approximately 1,000 feet from the site. Groundwater from the QAS site may potentially discharge to the oxbow; although a hydrogeologic connection between site groundwater and the oxbow has not been verified. Access to the oxbow is not restricted, but access would be limited due to the interstate and industrial-type businesses, such as the automobile salvage yards located adjacent to the oxbow. Therefore, there is limited potential for direct exposures to surface water and sediments of the oxbow by recreational users. If impacted groundwater from the site were to discharge to the oxbow at detectable or elevated concentrations, there would be a potential for recreational users to be exposed to COPCs in surface water. Potential current exposures to constituents in surface water and sediment were conservatively evaluated by comparing the surface water and sediment data to screening levels (e.g., water quality criteria for human exposures). Under the groundwater remediation system shutdown scenario, potential future exposures to constituents in groundwater migrating and mixing with surface water were conservatively evaluated by calculating risk estimates for a recreational user receptor (see Sections 4.2.4.1 and 4.2.4.2).

4.2.3 Identification of Constituents of Potential Concern

The selection of COPCs is a screening process that involves: 1) review of the site characterization information, 2) evaluation of the data for usability in risk assessment, 3) refinement of the preliminary conceptual site exposure model, 4) screening of data against background and generic screening levels, and 5) identification of COPCs. The COPCs are those chemicals that are present because of past releases or activities at the site and most likely to be of concern to human health. Thus, the COPC screening process is designed to conservatively select those constituents having the highest likelihood of contributing to adverse health effects. Those chemicals which are present at concentrations greater than background or risk-based screening levels were retained for quantitative assessment.

All useable data from soil, groundwater, sediment and surface water samples were summarized by media. The COPC selection process for soil, groundwater, surface water and sediment is summarized in **Tables 4-2 through 4-5**.

Sample results from metal analyses were compared to background soil and groundwater levels from the Geochemical Survey of Missouri (Tidball, 1984) and Geochemical Survey of Waters of

Missouri (Feder, 1979). Those analytes that were detected above background levels were carried through the risk screening evaluation.

The tiered HHRA process consisted of initially conducting a risk-based screening evaluation of data using available default target levels and risk-based target levels. PRGs for non-residential land use and residential land use were used to screen all detected constituents in soil and groundwater samples, respectively, from the QAS site (USEPA, 2004). PRGs utilize a target cancer risk of 10^{-6} and a non-carcinogenic hazard index (HI) of 1.0.

If the MDC of an individual constituent did not exceed the lowest corresponding screening level (e.g., non-residential land use for soils), no further quantitative evaluation of the constituent was completed. Constituents with MDCs greater than PRGs were retained for additional screening by using pathway-specific risk-based levels.

4.2.3.1 Soil COPC Screening

Metals detected in soil samples were first screened to published Missouri background levels (Tidball, 1984). The mean concentrations of all detected metals were compared to mean background levels. Background levels were available for all metals, except silver and thallium. Site concentrations were found to be less than expected background levels for the region for the screened metals, except cadmium, mercury and nickel. Therefore, cadmium, mercury, nickel, silver, and thallium were retained for the further COPC screening as discussed below (Table 4-2).

In addition to the five metals mentioned above, 12 detected organic compounds were compared to the PRGs for non-residential land use. Soil PRGs are developed considering ingestion, inhalation of particulates, inhalation of volatiles, and dermal exposure pathways.

For COPC selection, the maximum detected concentration of soil samples from 1997/98 and 2000 of VOCs, SVOCs, herbicides, pesticides and PCBs, and toxic metals (above background levels) was used to compare to PRGs (Table 4-3). Of the 17 constituents detected in soil, only the maximum concentrations of methylene chloride and 1,1,2,2-tetrachloroethane (1,1,2,2-TCA) were greater than screening levels and thus identified as soil COPCs.

The concentrations of methylene chloride ranged from non-detect (< 0.05 mg/kg) to 111 mg/kg. It was detected in 11 soil samples, all at concentrations greater than the PRG of 21 mg/kg. The detected concentrations were found in samples from soil borings B-14, B-15, and B-16 at depths ranging from 2 inches to 15 feet bgs. The concentrations of 1,1,2,2-TCA ranged from non-detect (< 0.0125 mg/kg) to 15.3 mg/kg, also found in samples from depths ranging from 2 inches to

15 feet bgs. It was detected in only two of the 71 soil samples (B1 and B19). Only the concentration in sample B1 (4 inches) was greater than the PRG of 0.93 mg/kg.

4.2.3.2 Groundwater COPC Screening

Metals detected in groundwater samples were first screened to published Missouri background levels (Feder, 1979). The mean concentrations of detected metals were compared to mean background levels. Background levels were only available for ten metals. Site concentrations were found to be less than the expected background levels for the region for barium. The remaining nine metals were retained for further COPC screening as discussed below (**Table 4-4a**).

Impacted groundwater is not used as a domestic water source, nor is such use anticipated in the future. However, the MDCs measured since July 2003 (post-extraction system installation) from non-product wells were compared to PRGs for tap water (i.e., residential land use). The tap water PRGs were calculated based on the ingestion of drinking water and inhalation of volatiles from all household uses exposure pathways.

COPC screening results for constituents detected in groundwater are presented in **Table 4-4b**. The MDCs of nine metals and 19 organics were compared to tap water PRGs. The following 10 constituents (six VOCs and four metals) were detected at concentrations greater than the tap water PRGs and were selected as COPCs in groundwater:

- arsenic
- benzene
- cadmium
- cis-1,2,-dichloroethylene (cis-1,2-DCE)
- 1,4-dioxane
- lead
- manganese
- methyl tert-butyl ether (MTBE)
- trichloroethylene (TCE)
- vinyl chloride

4.2.3.3 Groundwater Transport Modeling COPCs

Groundwater transport modeling was conducted to evaluate potential impacts to off-site, downgradient receptors (e.g., surface water receptors). The nearest downgradient receptor is the

oxbow. All groundwater constituents that exceeded PRGs were selected as COPCs for the groundwater modeling evaluation. The following six VOCs and four metals were selected as the COPCs for the evaluation of turning off the current remediation system:

- benzene
- cis-1,2-DCE
- 1,4-dioxane
- MTBE
- TCE
- vinyl chloride,
- arsenic
- cadmium
- lead
- manganese

Chlorinated ethenes (TCE, cis-1,2-DCE, and vinyl chloride) were modeled using the U.S. EPA's BIOCHLOR model (version 2.2). Benzene, 1,4-dioxane, MTBE, and the metals were modeled using the standard Domenico fate and transport model.

4.2.3.4 LNAPL Screening

As discussed in earlier sections, LNAPL has been present in wells EPA-R-1, GW-2R, GW-3, and GW-4. Samples of groundwater beneath the LNAPL layer were collected from these wells via micro-purge sampling. Analytical results for VOCs (2004, 2005, and 2006) and metals (2005, and 2006) are presented in **Appendix C**.

Samples collected from below the LNAPL layer can be assumed to represent dissolved phase groundwater samples. When the results from the dissolved phase samples are compared with maximum detected concentrations in groundwater samples from non-LNAPL monitoring wells, many of the concentrations in the non-LNAPL well samples are greater. This indicates that dissolved phase concentrations from the LNAPL-containing wells will likely result in similar downgradient groundwater concentrations as currently detected. Thus, it is expected that the constituents and concentrations migrating away from the site will be adequately represented by the groundwater samples from the monitoring wells downgradient from the LNAPL wells. As such, the risk assessment screening process adequately addresses the constituents of potential concern at the site.

4.2.3.5 Groundwater to Indoor Air COPC Screening

To evaluate potential future off-site residential exposures to volatilized constituents from groundwater to indoor air (assuming impacted groundwater migrates to a potential off-site receptor), the MDCs of the groundwater COPCs were compared to generic screening levels provided in EPA's Draft *Guidance for Evaluating the Vapor Intrusion to Indoor Air Pathway from Groundwater and Soils*, referred to as the Subsurface Vapor Intrusion Guidance (USEPA, 2002). This guidance presents a tiered approach to evaluating the potential impacts associated with the vapor intrusion pathway.

The first step is a preliminary screening to determine whether the COPCs have characteristics to be of concern under this pathway, i.e., to result in unacceptable indoor inhalation risks. Using Table 1 of the Subsurface Vapor Intrusion Guidance, the COPCs in groundwater were screened to determine if they exhibited sufficient volatility and toxicity to be of concern. Based on the preliminary screening, benzene, cis-1,2-DCE, 1,4-dioxane, MTBE, TCE, and vinyl chloride exhibit chemical characteristics to be of concern for this pathway.

Next, a Tier 2 screening was completed by comparing groundwater concentrations to established groundwater goals, which are protective of the indoor air pathway. Two groundwater screening levels were used: the Generic Screening Levels (GSL) for groundwater at a target risk level of 1×10^{-6} (Table 2C of the Guidance) and a scenario-specific screening level based on site-specific adjustments for soil type and depth to groundwater (Table 3C of the Guidance). The depth to groundwater is 15 feet bgs. The soil lithology varies from silts to silty clay to clays. Thus, in accordance with the guidance, target groundwater concentrations were selected using a vapor attenuation factor (α) of 1×10^{-4} obtained from Figure 3b of USEPA (2002). This attenuation factor was based on a groundwater depth of 15 feet and loam type soils. The results of the Tier 1 and 2 screening process of the vapor intrusion pathway are shown on **Table 4-4c**.

The MDCs for TCE and vinyl chloride exceeded the groundwater screening levels for the vapor intrusion pathway. A vapor intrusion screening level was not available for 1,4-dioxane. Thus, 1,4-dioxane, TCE and vinyl chloride were further evaluated under a Tier 3 vapor intrusion analysis.

4.2.3.6 Surface Water COPC Screening

Ten surface water samples were collected from the oxbow (**Figure 5**). No volatile organic compounds were detected in surface water samples from the oxbow or the Blue River. The occurrence, distribution and comparison of metals (totals) in surface water to available screening

levels and background levels is provided in **Table 4-5a**. Barium, chromium, lead, manganese and selenium were detected in surface water samples from the oxbow.

Background levels that were considered included the upgradient surface water sample from the Blue River and Missouri groundwater background levels. Of the five metals detected in surface water, the detected concentrations for chromium and selenium were less than or comparable to the background levels.

The maximum barium concentration (0.2 mg/L) was above the upgradient level of 0.1 mg/L. The remaining two metals, lead and manganese, were detected above available regional background groundwater levels. Neither the oxbow, nor the Blue River, is designated for groundwater use. The concentrations of barium, lead and manganese were compared to EPA's Ambient Water Quality Criteria (AWQC) for human health (EPA, 2006). Barium concentrations were less than the available AWQC. There is not an AWQC established for lead. The MDC of manganese in surface water was above the AWQC.

The oxbow is located in an industrial setting and there are multiple potential point and non-point sources of runoff and pollution. MDNR reported that the Blue River is subject to severe point and non-point source pollution (MDNR 1984). Four of the five maximum detected concentrations were found in sample location OX-10. This location is located 1,200 feet northwest of the site, but just down the hill from a junkyard. The oxbow lies along the base of the hill where the junkyard is located. As such, it would be difficult to conclude that any of the surface water detections were site-related. However, lead and manganese were retained as COPCs in groundwater. COPCs identified under the Groundwater Modeling scenario above were also evaluated for potential impacts to surface water in the evaluation of the post-extraction system condition evaluation (Section 4.2.4.3). Therefore, the surface water COPCs of lead and manganese were further evaluated under the groundwater modeling scenario. .

An ecological evaluation of the surface water and sediment data is provided in Section 5.0.

4.2.3.7 Sediment COPC Screening

Ten sediment samples were collected from the oxbow. No VOCs were detected in sediment samples from the oxbow. The occurrence, distribution and comparison of metals (totals) in sediment to available screening levels is provided in **Table 4-5b**. The sediment samples were compared to soil background levels. All analytes were found to be less than background soil levels, except lead, mercury, and nickel. These three analytes were then compared to soil PRGs for residential land use, as the PRGs would be more conservative than a recreational exposure to

sediments. All the analytes were detected below residential screening levels. Therefore, no COPCs were identified in sediments.

An ecological evaluation of the surface water and sediment data is provided in Section 5.0.

4.2.3.8 Summary of COPC Screening

Methylene chloride and 1,1,2,2-TCA were retained as COPCs in soil, and 10 COPCs were retained in groundwater: arsenic, benzene, cis-1,2-DCE, cadmium, 1,4-dioxane, lead, manganese, MTBE, TCE, and vinyl chloride.

The groundwater COPCs were evaluated for the potential to contribute to indoor air risks. The groundwater to indoor air COPCs include 1,4-dioxane, TCE, and vinyl chloride.

To evaluate potential downgradient migration of constituents in groundwater and associated off-site exposures, the same groundwater COPCs were retained for the groundwater modeling scenarios.

No VOCs were detected in surface water or sediment samples. The analytes detected in sediment samples from the oxbow were found to be at below or comparable levels to background levels or screening levels. Thus, no COPCs were selected for sediments. The COPCs of lead and manganese in surface water were further evaluated under the groundwater modeling scenario.

4.2.4 Quantification of Potential Exposures

Potential exposures to COPCs were further evaluated according to the exposure areas described above and summarized in the CSM (**Table 4-1**). The 19 soil sampling locations (B1-B19) were all located within Off-Site Area 1. The groundwater monitoring wells were grouped according to two exposure areas: 1) the QAS site boundaries and adjacent Deffenbaugh-owned properties were considered Off-Site Area 1, and 2) Off-Site Area 2 included the wells downgradient of the western edge of the extraction system (i.e., nested wells GW-8, -9, 10, and 12).

4.2.4.1 Determination of Exposure Point Concentrations

A representative exposure point concentration (EPC) was calculated for each COPC for each media in accordance with EPA guidance documents (USEPA 2002). USEPA guidance recommends the use of the 95% upper confidence limit (UCL) on the arithmetic mean concentration, unless the 95% UCL is greater than the maximum detected value. If the 95% UCL is greater than the maximum detected concentration, the maximum detected value is the recommended value for the EPC.

Soil EPCs

To account for specific activities that may occur within Off-site Area 1 (e.g., commercial worker vs. construction worker), this area was evaluated within sub-exposure areas. The data was grouped into subsets to calculate exposure scenario-specific EPCs. This was done in order to avoid potentially biasing the EPCs downward due to including more non-detect results. For example, samples B17 to B19 were located within the on-site QAS building. All results were non-detect and not included in EPC calculations. Soil samples representative of each potential exposure receptor are described below.

Indoor Commercial Worker: Samples collected from 0 to 1 foot (EPA, 2001a) from locations B1-B13 were used to estimate surface soil EPCs to evaluate incidental ingestion exposures to indoor workers. For the subsurface volatilization to indoor air pathway, all data from samples B-1 through B-13 collected within the top 15 feet were used to calculate an EPC. Of the two COPCs in soil, only 1,1,2,2-TCA was detected in these exposure areas.

Outdoor Commercial Worker: To evaluate potential exposures to outdoor workers, shallow soil EPCs were calculated using soil data from B1 to B16 from the 0 to 2 feet range (EPA, 2001a). Both soil COPCs, methylene chloride and 1,1,2,2-TCA, were detected in this exposure area.

Construction Worker: Data used to estimate the subsurface soil EPC included samples collected from the surface to the saturated zone in locations B14, B15 and B16. Since average depth to groundwater is 15 feet bgs, data points between 0 and 15 feet were included with the subsurface soil data. These sampling locations are along Marsh Avenue, in the area most likely to incur construction-type activity. Of the two COPCs in soil, only methylene chloride was detected in this exposure area.

For samples with non-detect results, one-half the detection limit was used in the data set. The Shapiro-Wilk test of normality (Gilbert, 1987) (for samples sizes less than 50) or the Lilliefors Test (for sample size greater than 50) was used for all COPCs to determine if the data fit a normal or lognormal distribution. For data sets that were determined to be normally distributed, the t-statistic equation was used to estimate the 95% UCL. For data sets that were determined to be lognormally distributed, the H-statistic equation was used to estimate the 95% UCL. For data sets that were determined to be neither normal nor lognormally distributed, non-parametric techniques were used to estimate the 95% UCL. USEPA's ProUCL Program was used to calculate 95% UCLs. The ProUCL statistical summaries are included in **Appendix E**. The surface, shallow and subsurface soil EPC results are provided in **Table 4-6** for Off-Site Area 1.

Current Conditions - Groundwater EPCs

Data from monitoring wells GW-1, GW-5, GW-6 (A,B), GW-7, GW-11 (A,C,B), and EPA-R3 were used to estimate EPCs for On-Site/Off-Site Area 1. See **Table 4-7** for a summary of the estimated EPCs for groundwater for Off-Site Area 1. Data from monitoring wells GW-8 (A,C,B), GW-9 (A,B), GW-10 (A,C,B), and GW-12 (A,C,B) were used to estimate EPCs for Off-Site Area 2. See **Table 4-8** for a summary of the estimated EPCs for groundwater for Off-Site Area 2. Of the 10 COPCs in groundwater, benzene and MTBE were not detected in Off-site Area 2 groundwater wells. Therefore, EPCs were not calculated for these two constituents.

Table 4-9 summarizes the modeled EPCs for volatilized COPCs from soil to ambient air. The estimated ambient air concentration from soil takes into account volatilization of constituents into air using a chemical-specific volatilization factor (VF) and concentrations from dust into air using a particulate emission factor (PEF). Based on chemical characteristics, it is assumed that a compound is available either volatilized into air (e.g., a volatile organic) or adheres as particulate matter to airborne particles (e.g., semi-volatiles or metals); but not both. Standard EPA methodology was used to calculate the ambient air concentrations and the model equations and input parameters are provided in **Table 4-9**.

Post-extraction Conditions – Downgradient Groundwater EPCs

Groundwater modeling was used to predict potential migration of groundwater COPCs from the site to the nearest potential exposure point (i.e., oxbow). The Domenico models were run with degradation and an infinite source. Benzene, 1,4-dioxane, MTBE, and metals typically do not easily degrade under the anaerobic conditions present at the site. Chlorinated ethenes (TCE, cis-1,2-DCE, and vinyl chloride) were modeled using the EPA's BIOCHLOR model (version 2.2). Benzene, 1,4-dioxane, MTBE, and the metals were modeled using the standard Domenico fate and transport model without degradation.

Model input values were selected based on 95% UCL chemical concentrations in groundwater and site hydrogeologic conditions (e.g., aquifer thickness, groundwater gradients, effective porosity, and hydraulic conductivity) for each of the three aquifer zones at the site. Model parameters and chemical-specific parameters are summarized in **Tables 4-10** and **4-11**, respectively. The distance from GW-4 (source area/Off-Site Area 1) to the oxbow is approximately 700 feet. The distance from the western edge of Off-Site Area 2 to the oxbow is approximately 400 feet. Modeling was conducted for both areas to capture a worst-case scenario. A full description of the groundwater model is provided in **Appendix G**.

The predicted groundwater EPCs for the chlorinated COPCs using BIOCHLOR are provided in **Table 4-12a**. Zone-specific groundwater concentrations were estimated for 1,2-DCE, TCE, and vinyl chloride. The A and C zones connect to the surface water channels (i.e., oxbow and Blue River). All downgradient groundwater concentrations were estimated to be non-measurable for all three zones and time periods.

The predicted groundwater EPCs for the non-chlorinated COPCs using Domenico are provided in **Table 4-12b**. Results for each of the three aquifer zones within each Offsite Area were the same, since the second term in the Domenico equation includes the first order degradation rate. This term of the Domenico equation includes the retardation rate and groundwater velocity. The value of the first order degradation rate for each of the compounds (1,4-dioxane, MTBE, metals, and benzene under anaerobic conditions) is zero. If the degradation rate is zero, the entire second term of the Domenico equation becomes zero, and therefore there is no difference in the calculated concentrations for each zone since the groundwater velocity and retardation rate terms effectively become zero. The maximum modeled groundwater concentrations at the oxbow were used to evaluate human health exposure under the recreational user scenario and ecological risks in the ecological risk assessment.

Post-extraction Conditions – Groundwater to Surface Water EPCs

Given the small size of the oxbow, particularly relative to the amount of groundwater flowing in its vicinity, along with the fact that frequent flooding of the oxbow by normal storm events changes the water in the oxbow, a dilution factor was calculated. The data used to support the dilution factor is discussed below.

The amount of groundwater discharge to the entire oxbow was calculated using the following equation:

$$Q = K \times i \times w \times t$$

where:

Q = groundwater discharge (ft³/day)

K = hydraulic conductivity (ft/day)

i = hydraulic gradient adjacent to the oxbow (unitless)

w = width of oxbow (ft)

t = saturated thickness of impacted portion of the aquifer (ft)

The hydraulic conductivity used was 0.004 feet per day, which is the hydraulic conductivity of the A zone, into which the oxbow is incised. The hydraulic gradient was 0.045 feet per foot, as measured in the A zone wells in April of 2007. The width of the oxbow was 2,180 feet and the saturated thickness used was 40 feet. These values lead to a Q of 15.7 ft³/day.

The amount of groundwater discharge containing impacted groundwater was also calculated using the above formula. The only difference between the two calculations was that the width was changed to the width of the plume, which was calculated to be 230 feet. The Q of the impacted groundwater was 1.7 ft³/day. The ratio of impacted groundwater to total groundwater is 10.5 percent.

These calculations do not take into account that in times of high water the water in the oxbow will be completely replaced with new water. The daily stream flow statistics for United States Geological Survey gauging station 06893590, located immediately downstream from the oxbow, were reviewed. The mean daily values for each day of the month for each month of the year for a four-year period were reviewed. A minimum of 12 high water events were noted, with a high water event being defined as an event where the flow rate has increased by a factor of about 100 when evaluating the month as a whole. All but two of the events occurred in the spring, summer, and fall. Therefore, a conservative estimate is that the water in the oxbow is completely overturned about 10 times per year. This leads to another factor of 0.027 (10 events per year divided by 365 days/year) for groundwater dilution, resulting in an overall dilution factor of 11 percent.

4.2.4.2 Determination of Chemical Intakes

Exposure doses were estimated for chemicals exhibiting noncarcinogenic and carcinogenic effects. Average daily doses (ADDs) for noncarcinogens were averaged over the duration of exposure. Average daily doses for carcinogens were averaged over a lifetime, and are given the acronym LADD for lifetime average daily doses.

The ADDs and LADDs are estimated using exposure point concentrations of chemicals together with exposure parameters that specifically describe the exposure pathway. ADDs and LADDs for each pathway were derived by combining the selected exposure point concentration of each chemical with the exposure variables. When determining the ADDs and LADDs, chemical concentrations were assumed to remain constant over the exposure period.

Exposure estimation calculations were based on standard USEPA formulas and variables (USEPA, 1989, 1991, 2001, 2002). The specific exposure estimation assumptions are described below for the identified pathways of concern for each exposure area. In accordance with

standard risk assessment procedures, all exposures are expressed as average daily intake over the period of exposure (mg chemical per kilogram body weight per day).

On-Site and Off-Site Area 1

These exposure areas include the QAS site and adjacent properties to the north, south, and west owned by Deffenbaugh. Potential receptors include indoor and outdoor C/I workers and construction workers. Consistent with the exposure areas of the CSM, soil data were grouped as On-Site (locations B-17 to B-19) and Off-Site Area 1 (locations B-1 to B-16). No COPCs were identified in soil samples from the on-site borings. Methylene chloride and 1,1,2,2-TCA were identified as the COPCs in soil samples associated with Off-Site Area 1.

It was also noted that prior to capping the source area in On-Site Area 1, the impacted soils had been excavated and removed from the site per the 1994 Administrative Order on Consent and subsequent Corrective Action for the site. The excavated area was then backfilled and an engineered cap installed over this area. It was assumed in this risk assessment, based on the existing Land Use Restriction, that the capped area would not be disturbed and that there would be very limited future exposure to subsurface soils lying beneath the capped area.

As noted above, potential receptors to the exposed surface soil include current/future indoor and outdoor commercial/industrial workers. The outdoor worker is a long-term receptor exposed during the work day and spends most of his/her time conducting maintenance activities outdoors. The activities for this receptor (e.g., moderate digging, landscaping) typically involve exposures to surface and shallow subsurface soils (depths of zero to two feet). The outdoor worker is expected to have a higher soil ingestion rate than the indoor worker (100 mg/day vs. 50 mg/day), and is assumed to be exposed to COPCs via the following pathways: incidental ingestion of soil, dermal absorption of COPCs from soil, inhalation of fugitive dust, inhalation of volatiles outdoors. The indoor worker spends most, if not all, of the workday indoors. Thus, an indoor worker has no significant direct contact with outdoor soils. This worker may, however, be exposed to COPCs through incidental ingestion of contaminated soils that have been incorporated into indoor dust and the inhalation of contaminants present in indoor air as the result of vapor intrusion. See **Table 4-13** for the soil-related exposures and parameters (e.g., ingestion, dermal, and inhalation of dust and ambient air) for commercial/industrial workers.

Under the construction worker scenario, potential risks were evaluated for exposures to COPCs in surface and subsurface soil via the incidental ingestion, dermal contact, and inhalation of COPCs volatilized into ambient air pathways. See **Table 4-14** for the soil-related exposures and

parameters (e.g., ingestion, dermal and inhalation of dust and ambient air) for construction workers.

To evaluate the groundwater to indoor air pathway for On-Site/Off-Site Area 1, the groundwater to indoor air COPCs, 1,4-dioxane, TCE, and vinyl chloride, were further assessed. Potential exposures to indoor air were estimated for the groundwater vapor intrusion pathways using the Johnson and Ettinger (J&E) Model (USEPA, 2002). The J&E Model is a one-dimensional analytical solution to convective and diffusive vapor transport into indoor spaces, and provides an estimated attenuation coefficient that relates the vapor concentration in the indoor space to the vapor concentration at the source of contamination. The model is constructed as both a steady-state solution to vapor transport (infinite or non-diminishing source) and as a quasi-steady-state solution (finite or diminishing source). Inputs to the model include chemical properties of the contaminant, saturated and unsaturated zone soil properties, and structural properties of the building. Chemical and physical properties of the COPCs (i.e., TCE, vinyl chloride and 1,4-dioxane) were obtained from Exhibit C-1 of the Supplemental Soil Screening Level Guidance (EPA, 2001a) and the Hazardous Substance Data Bank online (HSDB, 2005).

Non-residential exposure parameters were used to match current and expected future land use for Off-Site Area 1. The input parameters (e.g., interior building room volume, slab thickness, and soil type) and results used in the J&E Model are provided in the Summary Sheets in **Appendix F**. Hypothetical future building construction was assumed to be slab-on-grade due to the existing slab-on-grade buildings in the area and the shallow depth to groundwater and bedrock of the site area.

The floor-wall seam crack value used in the model is 0.1 cm, which is the USEPA-recommended J&E model default value. The air exchange rate used was 0.83 exchanges per hour, based on the MDNR (2005) recommended default for a non-residential structure. Other standard non-residential exposure parameters include an exposure duration of 25 years and an exposure frequency of 225 days per year for the indoor worker.

SUMMARY OF BUILDING-RELATED PARAMETERS FOR THE VAPOR INTRUSION MODEL

Input Parameter	Units	Default Value	C/I Scenario
Building Air Exchange Rate	hr-1	0.25	0.83
Building Mixing Height – Slab-on-Grade Scenario	m	2.44	√
Building Footprint Area – Slab-on-Grade Scenario	m ²	100	√
Subsurface Foundation Area – Slab-on-Grade Scenario	m ²	106	√
Depth to Base of Foundation – Slab-on-Grade Scenario	m	0.15	√
Perimeter Crack Width	mm	1	√
Building Crack Ratio – Slab-on-Grade Scenario	dimensionless	3.77 x 10 ⁻⁴	√
Building Foundation Slab Thickness	m	0.1	√

In those areas where LNAPL has been detected (wells GW-3, GW-4, and EPA-R-1), there is a potential for volatile COPCs to migrate from groundwater to indoor air. This area consists of the western boundary of the QAS site and extends across Marsh Avenue to EPA-R-1, just on the other side of the street. Currently, there are no buildings above areas of detected LNAPL. The nearest buildings to an LNAPL well are the QAS on-site building, located approximately 20 feet from GW-3 to the southeast and the vacant Livers building, located approximately 100 feet from EPA-R-1 to the northwest, across Marsh Avenue. Given the limited data regarding LNAPL composition at the site, potential exposures to COPCs in LNAPL via this pathway were not quantitatively assessed. The QAS on-site building is located upgradient from the LNAPL flow direction, thus resulting in limited potential for the LNAPL to migrate beneath the building. The vacant Livers building is located downgradient of plume flow but at 100 feet from the nearest LNAPL well, thus limiting potential for indoor air impacts (USEPA, 2002). If new buildings are constructed and occupied in areas above or near the LNAPL area (e.g., less than 100 feet), it is possible that exposures via the groundwater to indoor air pathway may result in significant inhalation exposures for receptors in these hypothetical buildings. However, the Land Use Restriction recorded for the site prohibits construction of a building over the cap area.

Off-Site Area 2

There is no soil data for Off-Site Area 2. As previously referenced, there is no potable use of impacted groundwater currently, nor is impacted groundwater expected to be a potable source in the future. Potential receptors include off-site C/I and off-site residents.

Potential exposures via the groundwater to indoor air pathway at downgradient, off-site locations were evaluated using the COPCs selected in groundwater samples from monitoring wells in Off-Site Area 2. These COPCs include cis-1,2-DCE, 1,4-dioxane, TCE, and vinyl chloride. Benzene and MTBE were not detected in Off-Site Area 2 wells.

Residential exposure parameters were used in the model since residential land use currently exists off-site. Standard residential default exposure parameters such as an exposure duration of 30 years and an exposure frequency of 350 days per year were used in the evaluation. The J&E Model Summary Sheets for Off-Site Area 2 are provided in **Appendix F**.

SUMMARY OF BUILDING-RELATED PARAMETERS FOR THE VAPOR INTRUSION MODEL

Input Parameter	Units	Default Value	Residential Scenario
Building Air Exchange Rate	hr-1	0.25	√
Building Mixing Height – Basement Scenario	m	3.66	√
Building Footprint Area – Basement Scenario	m ²	100	√
Subsurface Foundation Area – Basement Scenario	m ²	180	√
Depth to Base of Foundation – Basement Scenario	m	2	√
Perimeter Crack Width	mm	1	√
Building Crack Ratio – Basement Scenario	dimensionless	2.2×10^{-4}	√
Building Foundation Slab Thickness	m	0.1	√

Oxbow - Post Extraction Scenario

Under this scenario, it was assumed that the currently operating groundwater extraction and control system would be shut down. Potential migration and discharge of impacted groundwater to surface water could create a possible surface water exposure point at the oxbow and possibly at the Blue River main channel. Possible routes for human exposure to COPCs in surface water are ingestion and dermal contact. The inhalation pathway is not expected to be significant due to low levels of VOCs at the oxbow.

Estimated groundwater concentrations potentially reaching the oxbow were modeled using BIOCHLOR and Domenico models. The modeled groundwater concentrations are provided in **Tables 4-12a** and **4-12b**.

The maximum modeled downgradient groundwater concentration (from Zone A) to the oxbow for each COPC was used to estimate potential EPCs in surface water. To account for the mixing

zone from groundwater discharging to surface water, a dilution factor as described in Section 4.2.4.1 was applied to the modeled groundwater concentrations. The groundwater-to-surface water EPCs are provided in **Table 4-15a**.

Identified receptor populations associated with potential exposures were recreational users encountering direct contact with surface water at the oxbow or Blue River. Direct exposure to surface water was assessed for future recreational users at the oxbow of the Blue River. Incidental ingestion and dermal absorption exposures are estimated in this risk assessment. **Tables 4-15b and 4-15c** present the surface water equations and exposure assumptions for adult and child recreational users, respectively. For the most part, default exposures for residential swimming exposures provided in EPA's RAGS Part E - Dermal Assessment Guidance were used. This scenario assumes the total body surface area is exposed to the surface water. Since the depth of water in the oxbow can be very shallow (e.g., less than 1 foot), this is a very conservative assumption. There are no default values for exposure frequency (EF) for recreational users, as this is dependent on site characteristics and regional climates. For this assessment, an EF of 20 days per year was used, assuming recreational users visit the oxbow 1 day/week for 5 months/year. **Tables 4-16a and 4-16b** provide the equations and calculations for the dermal absorbed event (DAevent) for exposures to COPCs in surface water. Models and equations used to evaluate the recreational scenario are standard models from EPA (USEPA, 1989 and 2004).

4.3 Toxicity Assessment

This section presents the types and sources of toxicological information used for the risk assessment. The toxicity assessment provides a description of the relationship between a dose of a chemical and the anticipated incidence of an adverse health effect. **Tables 4-17a, 4-17b and 4-18** summarize the non-carcinogenic and carcinogenic toxicity information used in this analysis.

The toxicity value hierarchy policy, per OSWER Directive 9285.7-53, dated December 5, 2003, was followed. The hierarchy is as follows:

- EPA's Integrated Risk Information System (IRIS): on-line database
- Tier 2 - EPA's Provisional Peer Reviewed Toxicity Values (PPRTVs): The Office of Research and Development/National Center for Environmental Assessment/Superfund Health Risk Technical Support Center (STSC) develops PPRTVs on a chemical-specific basis when requested by EPA's Superfund program.
- Tier 3 - Other Peer-Reviewed Toxicity Values: Tier 3 includes additional EPA and non-EPA sources of toxicity information. Priority should be given to those sources of information that are the most current, the basis for which is transparent and publicly

available, and which have been peer reviewed. These sources include Health Effects Assessment Summary Table (HEAST), Agency for Toxic Substances and Disease Registry (ATSDR) Minimum Risk Levels, and California EPA toxicity values.

4.3.1 Non-Carcinogens

Non-carcinogenic risks are evaluated using Reference Doses (RfDs) or Reference Concentrations (RfCs). USEPA's approach to assessing the risks associated with non-carcinogenic toxicity is based on the premise that there are thresholds for toxic effects. This means that theoretically a safe level of exposure can be defined. The RfD represents this level.

- The RfD is expressed as a daily intake (mg/kg-day), and represents the safe intake over an exposure period. Safety factors are added into the RfD derivations based on interspecies extrapolations, exposure route extrapolations, and receptor sensitivity. These safety factors are known as Uncertainty Factors (UFs) and Modifying Factors (MFs), and are defined in USEPA's reference dose background document (USEPA, 1993).
- The RfC is analogous to the oral RfD, and is likewise based on the assumption that thresholds exist for certain toxic effects such as cellular necrosis. The inhalation RfC considers toxic effects for both the respiratory system (portal-of-entry) and for effects peripheral to the respiratory system (extrarespiratory effects). It is expressed in units of milligrams/cubic meter (mg/m³). The RfC is an estimate of a continuous inhalation exposure to the human population (including sensitive subgroups) that is likely to be without an appreciable risk of deleterious effects during a lifetime. It can be derived from a No Observed Adverse Effect Level (NOAEL), Lowest Observed Adverse Effect Level (LOAEL), or benchmark concentration, with uncertainty factors generally applied to reflect limitations of the data used.

The J&E Model utilizes the RfC to estimate potential non-cancer adverse effects. For COPCs where toxicity values are provided as inhalation RfDs in mg/kg-day, the RfDs were converted to RfCs (mg/m³) by multiplying by 70 kg body weight and 1/20 m³/mg inhalation rate.

Additional route extrapolation is the use of oral toxicity values for evaluating dermal exposures. For the most part, toxicity values listed in EPA databases are based on administered dose. Thus, to characterize risk from the dermal exposure pathway, adjustment of the oral toxicity factor to represent an absorbed dose is necessary. The adjustment accounts for the absorption efficiency within the gastrointestinal tract. For example, when absorption of a given constituent is essentially complete (i.e., 100%), the absorbed dose is equivalent to the administered dose, and therefore no toxicity adjustment is necessary. When gastrointestinal absorption of a chemical is poor (e.g., 1%), the absorbed dose is much smaller than the administered dose; thus, toxicity

factors based on absorbed dose should be adjusted to account for the difference in the absorbed dose relative to the administered dose.

The recommended GI absorption values (ABS_{GI}) for those COPCs with chemical-specific dermal absorption factors are presented in **Table 4-18**. Since sound scientific data is not readily available for making adjustments to other COPCs, the oral RfD was applied without an adjustment factor to estimate the dermal toxicity value.

4.3.2 Carcinogens

USEPA's assumptions in evaluating carcinogenicity are different from non-carcinogenic toxicity in that carcinogenicity is considered "non-threshold," and there is theoretically no level of exposure without some level of risk (USEPA, 1992b). Therefore, carcinogenic potential for chemicals is expressed as a dose-response relationship between the exposure (in mg/kg-day) and a risk level. The dose response value is referred to as the carcinogenic slope factor (SF), with units of $(\text{mg/kg-day})^{-1}$.

Because of the variability in the quality and reliability of the underlying databases used to assess carcinogens, USEPA applies a weighting system as follows:

Group	Category
A	Human carcinogen
B	Probable human carcinogen
B1	Indicates limited human evidence
B2	Indicates sufficient evidence in animals and inadequate or no evidence in humans
C	Possible human carcinogen
D	Not classifiable as to human carcinogenicity
E	Evidence of non-carcinogenicity for humans

It should be noted that the weight-of-evidence classifications do not directly impact the quantitation of risk. Chemicals with higher classifications may have lower estimated carcinogenicity (CSFs) than those with lower ratings. Rather, this system is a qualitative indicator of the reliability of the underlying data on which the CSFs, if any, are based.

Cancer risks from exposure to trichloroethylene were estimated using the original 1987 provisional cancer slope factor (0.011 per mg/kg-day) and the upper end of the range of draft values (0.4 per mg/kg-day) provided in the August 2001 Trichloroethylene Health Risk Assessment: Synthesis and Characterization, External Review Draft [2.0E-02 to 4.0E-01 (mg/kg-day)⁻¹]. Also, the risk assessment used the Reference Concentration (RfC) provided in the draft TCE health risk assessment for quantitative risk characterization (per comments from EPA Region 7, dated February 27, 2006).

The J&E Model uses Inhalation Unit Risks (mg/m³)⁻¹, thus inhalation CSFs were multiplied by 20 mg/m³ inhalation rate and 1/70 kg body weight.

Similar to the route-to-route discussion above, the oral slope factor is applied without an adjustment factor to estimate the dermal toxicity value when no data is available.

4.4 Risk Characterization

The risk characterization task combines the results of the exposure assessment and the toxicity assessment to derive site-specific hazards or risks. These site-specific hazards or risks in most cases are the quantified non-cancer hazards and theoretical excess lifetime cancer risks.

Non-cancer health effects for each chemical are referred to as a Hazard Quotient (HQ). HQs greater than one indicate potential for adverse health effects. Unlike chemicals potentially causing carcinogenic effects, noncarcinogenic compounds do not all produce the same type of effect by the same mechanism of action. Therefore, the effects from simultaneous exposures to all noncarcinogenic COPCs were computed by summing the HQs of chemicals affecting the same target organ within each exposure pathway. This sum is known as the Hazard Index (HI), and serves the same function for the mixture as the HQ does for the individual compound. In general, HIs which are less than one are not likely to be associated with any health risk, and are, therefore, less likely to be of regulatory concern than hazard indices greater than one.

For exposures to potential carcinogens, the individual upper-bound excess lifetime cancer risk was calculated by multiplying the estimated LADD by the upper-bound cancer toxicity value (e.g., cancer slope factor or unit risk for inhalation exposures). Upper-bound is a term used by USEPA to describe cancer slope factors and unit risks, meaning that actual risks are unlikely to be greater than the risks predicted using the upper-bound cancer slope factors. Using this approach, a risk level of 1×10^{-6} , for example, represents a one-in-one million increase in lifetime probability of an individual contracting cancer as a result of exposure.

It is important to note that, although the upper-bound cancer risk estimates provide plausible estimates of the upper limits of risk, the actual risk could be considerably lower. Since all carcinogenic chemicals produce the same effect, i.e., cancer, chemical-specific risks are assumed to be additive. Therefore, in order to assess the upper-bound individual excess lifetime cancer risks associated with simultaneous exposure to all carcinogenic COPCs, the risks derived from the individual chemicals were summed within each exposure pathway. The upper-bound lifetime excess cancer risks derived in this report were compared to USEPA's acceptable target risk range for health protectiveness of 1×10^{-6} to 1×10^{-4} (USEPA, 1990).

USEPA's Office of Solid Waste and Emergency Response (USEPA, 1991b) has issued a directive clarifying the role of HHRA in the Superfund process. The directive states that, where the cumulative carcinogenic site risk to an individual based on reasonable maximum exposure for both current and future land use is less than 1×10^{-4} , and the non-carcinogenic hazard index is less than 1, action generally is not warranted unless there could be adverse environmental effects.

4.4.1 Hypothetical Potable Use of Impacted Groundwater

Groundwater at the site contains concentrations of constituents that are greater than PRGs for residential use. The groundwater constituents with concentrations greater than PRGs include benzene, cis-1,2-DCE, 1,4-dioxane, MTBE, TCE, vinyl chloride, arsenic, cadmium, lead, and manganese. Potable use of water with the observed concentrations could present a significant human health risk. Site-specific upgradient or background levels of metals in groundwater were not available to evaluate whether detected concentrations in groundwater are representative of background levels. However, limited Missouri regional background groundwater levels were available and used to evaluate background conditions.

Currently, groundwater is not being used for domestic or industrial purposes. Potential risks associated with hypothetical future potable use of impacted groundwater were not quantified since this is not currently a complete pathway, nor is it expected to be a complete pathway in the future. The wells included in the Off-Site Area 2 exposure area are influenced by the extraction system and are included in the on-going monitoring program. Potential residential exposures of the COPCs in groundwater via the indoor inhalation pathway were quantitatively evaluated and discussed below.

4.4.2 On-Site and Off-Site Area 1

As previously discussed, this exposure area includes the QAS site and adjacent properties to the north, south and west owned by Deffenbaugh. Potential receptors include current or future outdoor and indoor C/I workers and future construction workers.

4.4.2.1 Soil Exposures

No COPCs in soil were identified for the On-Site Area.

Under the current/future non-residential land use scenario, indoor and outdoor commercial/industrial workers potentially exposed to COPCs in surface and shallow subsurface soil exposures (including airborne dust and vapors) were evaluated. Future construction workers potentially exposed to COPCs in subsurface soils (including airborne dust and vapors) were also assessed for Off-Site Area 1. These potential exposures were evaluated using the 95% UCL as the EPC and standard default exposure parameters from EPA guidance.

The chemical-specific hazard quotients for both the indoor and outdoor workers were less than one (see **Tables 4-19a and 4-19b**). For the indoor worker, the estimated excess lifetime cancer risks were 1×10^{-7} for the soil ingestion route and 1×10^{-10} for the subsurface soil inhalation (indoor air vapor intrusion) route (see **Table 4-20a and Table 4-23**). For the outdoor worker, the estimated excess lifetime cancer risks were 7×10^{-7} for the soil ingestion route and 8×10^{-5} for the soil inhalation (ambient air) route for an estimated excess lifetime risk of 8×10^{-5} (see **Table 4-20b**). The soil dermal route was not evaluated since the soil COPC is a volatile organic and all exposures were evaluated via the inhalation and ingestion routes. These estimated risks are less than or within EPA's target risk range of 10^{-4} to 10^{-6} .

Under the construction worker scenario, the chemical-specific hazard quotients associated with subsurface soil through the incidental ingestion and inhalation exposure routes (see **Table 4-21**) were less than one. The estimated excess lifetime cancer risks were 1×10^{-8} for the soil ingestion route and 2×10^{-6} for the soil inhalation route (see **Table 4-22**). These estimated risks are less than or within EPA's target risk range of 10^{-4} to 10^{-6} .

4.4.2.2 Groundwater Exposures

TCE, vinyl chloride, and 1,4-dioxane were retained as COPCs in groundwater, and representative EPCs were used to further evaluate the groundwater to indoor air pathway for Off-Site Area 1 (**Table 4-7**). Thus, estimated indoor air risks for indoor commercial workers associated with exposures to TCE, vinyl chloride, and 1,4-dioxane in groundwater were

calculated using the J&E Model and are summarized on **Table 4-23**. Summary spreadsheets from the J&E Model are provided in **Appendix F**.

Estimated excess lifetime cancer risks for potential commercial exposures to 1,4-dioxane, TCE, and vinyl chloride were found to be 3×10^{-9} , 2×10^{-8} and 4×10^{-8} , respectively. Estimated excess lifetime cancer risk associated with TCE, based on the lower bound toxicity value was 2×10^{-9} . These risk estimates are less than EPA's target risk range of 10^{-4} to 10^{-6} .

Non-cancer risks are also provided in **Table 4-23**. Estimated hazard indices associated with potential commercial exposures to 1,4-dioxane, TCE and vinyl chloride volatilizing into indoor air from groundwater were found to be 3.4×10^{-7} , 1.3×10^{-5} , and 1.4×10^{-4} , respectively, which are all less than the level of concern of 1.0.

4.4.2.3 Off-Site Area 1 Risk Characterization Summary

The total excess lifetime cancer risk for commercial indoor worker exposures to COPCs in soil and groundwater from Off-Site Area 1 is estimated to be 2×10^{-7} , primarily due to inhalation exposures of 1,1,2,2-TCA in soil. This risk estimate is less than EPA's acceptable risk range of 1×10^{-4} to 1×10^{-6} . The HIs across media (i.e., soil and groundwater) were summed resulting in a hazard quotient of 0.0003. This HQ is less than the level of concern for non-cancer effects of 1.0.

The total excess lifetime cancer risk for commercial outdoor worker exposures to COPCs in soil from Off-Site Area 1 is estimated to be 4×10^{-5} , primarily due to inhalation exposures of 1,1,2,2-TCA and methylene chloride in soil. This risk estimate is within EPA's acceptable risk range of 1×10^{-4} to 1×10^{-6} . The H's across exposure routes were summed resulting in a hazard quotient of 0.03. This HQ is less than the level of concern for non-cancer effects of 1.0.

The total excess lifetime cancer risk for future construction worker exposures to COPCs in soil from Off-Site Area 1 is estimated to be 2×10^{-6} , primarily due to inhalation exposures of methylene chloride in soil. This risk estimate is within EPA's acceptable risk range of 1×10^{-4} to 1×10^{-6} . The HI's across exposure routes were summed resulting in a hazard quotient of 0.087. This HQ is less than the level of concern for non-cancer effects of 1.0.

Human health risks were not quantified for potential exposures to vapors released from LNAPL on groundwater to indoor air. In those areas above where LNAPL has been detected, there currently are no buildings and thus the current exposure pathway is incomplete. However, if buildings are constructed and occupied in areas above LNAPL, it is possible that exposures via

the groundwater to indoor air pathway may result in significant human health risks for receptors in these hypothetical buildings.

4.4.3 Off-Site Area 2

Potential receptors include C/I workers and off-site residents. The only potentially complete exposure pathway identified for this area was the future groundwater to indoor air pathway. For this exposure pathway, 1,4-dioxane, TCE, and vinyl chloride were retained as COPC in groundwater from Off-Site Area 2. Since the most conservative receptor is the off-site resident, potential adverse health effects were only estimated for the off-site resident. Risk estimates for the COPCs in groundwater were calculated using the J&E Model and are summarized on **Table 4-23**. Estimated excess lifetime cancer risks for potential off-site residential exposures to 1,4-dioxane, TCE, and vinyl chloride in indoor air were found to be 6×10^{-10} , 9×10^{-8} and 4×10^{-9} , respectively. Estimated lifetime cancer risk associated with TCE, based on the lower bound toxicity value was 3×10^{-9} . The total excess lifetime cancer risk for residential exposures to COPCs in groundwater from Off-Site Area 2 was estimated to be 9×10^{-8} . These risk estimates are less than EPA's target risk range of 10^{-4} to 10^{-6} .

Estimated hazard indices associated with potential residential exposures to 1,4-dioxane, TCE, and vinyl chloride volatilizing into indoor air from groundwater were found to be 6.2×10^{-8} , 4.7×10^{-5} , and 9.4×10^{-6} , respectively. HQs were summed resulting in a HI of 5.6×10^{-5} , which is less than the level of concern of 1.0.

4.4.4 Inactive Groundwater Remediation Controls Scenarios

Estimated non-carcinogenic hazards for future recreational users of the Oxbow under this scenario are summarized in **Tables 4-24** and **4-25**. The exposure population for this pathway was recreational users swimming in the oxbow of the Blue River. The estimated HIs for these exposures for adults and children were both estimated to be 0.02. Since these estimated HIs are less than one, adverse non-carcinogenic health effects for recreational users of the oxbow of the Blue River are not anticipated under the future inactive groundwater remediation controls scenario.

Excess lifetime cancer risks for future recreational users of the oxbow of the Blue River under this scenario are summarized in **Table 4-26**. Recreational users of the oxbow of the Blue River have estimated excess lifetime cancer risk of 2×10^{-6} associated with swimming exposures. This estimated risk is within than EPA's target risk range of 10^{-4} to 10^{-6} .

4.5 Uncertainty Analysis

All risk assessments involve the use of assumptions, judgments, and incomplete data to varying degrees that may contribute to the uncertainty associated with the final estimates of risk.

Uncertainties may result from both the use of assumptions or models in lieu of actual data and from the error inherent in the estimation of exposure parameters. These uncertainties may result in the potential over- or under-estimation of receptor-specific risks. Based on the uncertainties described below, this HHRA should not be construed as presenting an absolute estimate of risk associated with exposure to constituents detected in groundwater at the site.

Consideration of the uncertainty associated with the components of the risk assessment process allows for a more meaningful interpretation of the results and a better understanding of the potential adverse effects on human health. Generally, the primary sources of uncertainty are associated with environmental sampling and analysis, selection of COPCs, exposure assessment, and the toxicity assessment. The effects of some of these potential uncertainties on the HHRA are discussed below.

4.5.1 Environmental Sampling and Analysis and Selection of COPCs

Error in chemical analyses may result from several sources including errors inherent in the sampling and analytical procedures. Analytical accuracy or sampling errors can result in the rejection of data, which decreases the available data for use in the HHRA, or in the qualification of data which increases the uncertainty in the detected constituent concentrations.

Considerable uncertainty is associated with the soil data since the soil data was collected in 1997 and 1998, and environmental concentrations of volatile organics in particular have likely degraded over time.

There is some uncertainty associated with the number and type of compounds selected for analysis in order to characterize potential contamination in groundwater. For example, constituents not analyzed for in the groundwater samples may be present. However, because the analytical suite was broad at the QAS site, it is unlikely that omission of some constituents in a minority of samples would change the risk estimates or conclusions significantly.

Selection of groundwater data used in the HHRA introduces some uncertainty in the HHRA. Because of on-going operation of the remedial pumping system, constituent degradation, migration, and transport throughout the environment, the MDCs of constituents in groundwater may not reflect actual concentrations currently present on site. Actual concentrations may be greater than estimated in this HHRA if a release is ongoing or if the remedial pumping system is

not performing at expected levels. Actual concentrations may be lower than estimated in this HHRA if constituents have degraded or migrated from the site over time. Therefore, the direction of bias is unclear.

4.5.2 Exposure Assessment

Exposure assessment is a single step in the HHRA process that uses a wide array of information sources and techniques. In the absence of reliable sources of data, assumptions and inferences are often made, which lead to varying degrees of uncertainties that lead to conservative exposure estimates. Sources of uncertainty in exposure assessment include the degrees of completeness and confidence in: (1) constituent concentration estimation (related to field measurement and modeling parameter estimation); (2) time of contact identification (for example, exposure scenario characterization, target population identification, and population stability over time); and (3) the methodology for constituent intake calculation. Variability or heterogeneity in exposure routes and exposure dynamics, such as age, gender, behavior, genetic constitution, state of health, and random movement of the potentially exposed populations, also introduce uncertainty to the exposure estimates.

The groundwater is not expected to be a source of drinking water, and ingestion of groundwater is not expected to occur because municipal water and sewer services are available throughout the area. Furthermore, results of the water well search indicate there are no potable water wells within a one-mile radius of the site. Although groundwater is currently not used as a drinking water source and is not likely to be used as a drinking water source in the future, there is some uncertainty associated with this evaluation, since at this time a deed restriction or ordinance is not in place prohibiting the installation of potable wells.

Assuming that the concentration in the groundwater is the same as the exposure concentration is a source of uncertainty in the exposure analysis. In this HHRA, constituent concentration characterization was accomplished indirectly by measuring concentrations in the groundwater rather than at the hypothetical point of contact. Environmental sampling performed to date was designed to assess the most likely impacted portion of the site and, thus, is likely biased toward high concentrations.

Under natural conditions, the groundwater flow direction generally follows the topographic surface. As such, groundwater from the site flows from east to west toward the low lying area of the oxbow. Similarly, it was assumed that groundwater from areas west of the Blue River flows eastward toward the river.

Because all constituent concentrations detected in groundwater were assumed to be constant over the exposure period, the estimated exposure doses are more likely to be overestimated rather than underestimated, especially for the risk-driving COPCs that degrade in the environment.

The use of MDCs for comparison to EPA Region 9 PRGs was conservatively applied to ensure that those chemicals with greatest toxicity were selected for quantitative evaluation. EPCs are better represented by a statistical estimate of central tendency. Thus, the conservative use of 95% UCLs as EPCs likely provided an overestimation of exposures and risks.

1,1,2,2-TCA was retained as a COPC in soil because one sample (15.3 mg/kg) out of 71 was detected above the Region 9 PRG. One additional sample contained 0.0191 mg/kg, while all the other samples were non-detect at a detection limit of 0.0125 mg/kg. The likelihood that this one sample, collected over eight years ago, contributes to any adverse health risks is minimal.

J&E Model. There are many uncertainties associated with the use of the J&E indoor air model used in the exposure assessment. For the indoor air model, risk and hazard estimates are heavily influenced by a few key variables, including the indoor air exchange rate, the floor-wall seam crack width, the enclosed space volume, and the soil gas concentration beneath the slab. A default indoor air exchange rate of 0.83 exchanges per hour from ASTM (2002) was used for current indoor worker exposures. However, it is possible that the actual building air exchange rate for commercial/industrial worker is much higher than this, given the exhaust fans and other HVAC system components that may be present in an industrial setting. The floor-wall crack width variable assumes soil gas can enter indoor air at the point where the building floor slab joins the outside walls. A default value of 0.1 cm was used. However, depending on the actual construction of the building, if there are no gaps where the floor slab joins the outside walls and there are no cracks in the floor slab itself, then no soil gas vapors would enter the building. The model assumes the areal extent of contamination is greater than that of the building floor in contact with the soil, and all vapors originating from below the building will enter the building. Also, the indoor air model does not account for transformation processes (e.g., biodegradation, hydrolysis, etc.), and this is very unlikely for the modeling time horizon of 25 to 30 years. These are examples of the many key variables that heavily influence the indoor air model. While it is difficult to predict, these factors may significantly overestimate indoor risks and hazards, or in certain conditions result in an underestimation of risks.

Outdoor Air Modeling Results. There are many uncertainties associated with the use of the outdoor air model used in the exposure assessment. For the outdoor air model, risk and hazard

estimates are heavily influenced by a few key variables and assumptions, including the assumption that VOC concentrations in soil do not change over time.

Groundwater Fate and Transport Modeling. There are many uncertainties associated with the use of the Domenico fate and transport model used in the exposure assessment. For the Domenico model, groundwater concentration estimates are heavily influenced by a few key variables, including chemical-specific parameters, hydrogeological parameters and source size. Chemical constituents used in the fate and transport modeling were the 95th UCL concentrations estimated in groundwater regardless of well location or date. Therefore, this data set does not represent a specific spatial or temporal portrait of site conditions, and calibration of the model to known conditions could not be performed. Several parameters were based on standard default assumptions or literature including degradation half-lives and retardation factors, soil porosity, soil bulk density, and the fraction of organic.

The source width was assumed to be the entire width of the capped and excavated source area. This source has been beheaded and may not represent the size and volume of impacted aquifer material contributing to the groundwater contamination. The hydraulic conductivity was calculated based on a pump test, dated July 21, 2003. Gradients for the A and B zones were calculated from November 2006 data collected while the system was shut-down for a period of time. There is some uncertainty whether the system reached complete equilibrium before measuring water levels in the wells.

While it is difficult to quantify the uncertainty, taken together, many of the key variables used for the fate and transport modeling are expected to overestimate the results due to the use of maximum concentrations and 'worst-case' scenario assumptions.

4.5.3 Toxicity Assessment

In most risk assessments, one of the largest sources of uncertainty is health criteria value. The health criteria used to evaluate long-term exposures, such as reference doses or cancer slope factors, are based on concepts and assumptions that bias an evaluation in the direction of overestimation of health risk. As USEPA notes in its Guidelines for Carcinogenic Risk Assessment (USEPA, 1986):

“There are major uncertainties in extrapolating both from animals to humans and from high to low doses. There are important species differences in uptake, metabolism, and organ distribution of carcinogens, as well as species and strain differences in target site

susceptibility. Human populations are variable with respect to genetic constitution, diet, occupational and home environment, activity patterns, and other cultural factors.”

Using 95% UCLs or maximum likelihood estimates for cancer slope factors for carcinogens and safety factors for reference doses for non-carcinogens compensates for these uncertainties. The assumptions provide a rough but plausible estimate of the worst-case scenario risk.

5.0 Screening Level Ecological Risk Assessment

5.1 Introduction

The screening level ecological risk assessment (SLERA) is intended to determine if there are actual or potential receptors on or near the QAS site or if ecological receptors are expected at or near the site. In addition, the SLERA addresses whether there is potential for exposure to COPCs by ecological receptors. This evaluation was conducted as a tiered process in accordance with the steps outlined in the EPA's Ecological Risk Assessment Guidance for Superfund (ERAGS) and other applicable guidance documents for conducting ecological risk assessments (EPA, 1997b and 1998b). Within the SLERA process, the ecological risk assessment has two steps. Step 1 consists of the Preliminary Problem Formulation and Step 2 is the Screening Level Exposure Assessment and Preliminary Risk Characterization. The SLERA process is described in the subsequent sections.

5.2 Preliminary Problem Formulation

Problem formulation includes the development of an ecological site conceptual model, a description of the environmental setting, the contaminant fate and transport and identification of potential ecological receptors.

5.2.1 Environmental Setting

The QAS site is an industrial property located within an industrial and commercial area of Blue Summit, Missouri. Due to land use and urbanization of the area, there is limited environment for natural areas and wildlife on and near the site. The site and surrounding area consists primarily of buildings, paved parking areas, driveways and roadways, with limited urban grass areas. As such, no significant natural ecosystem or sensitive environments are present on or near the site.

The nearest surface water body is the oxbow, located 700 feet downgradient of the site. The Blue River is located approximately 1900 feet from the site. The oxbow was created as a result of the U.S. Army Corps of Engineers flood control project that re-routed the flow of the Blue River and was cut into the A zone aquifer. The oxbow is the former river channel, although it has been highly modified and now serves primarily as a detention and flood control area for overflow from the current Blue River channel and for surface runoff. The oxbow was constructed with stone riprap lining the banks, and concrete barriers in the channel to slow any potential flow of water within the abandoned channel. Thus, the oxbow is not a 'natural' habitat area.

As part of the SLERA, ecological risk evaluation checklists (Checklist's A and B) from MDNR's Risk-Based Corrective Action Technical Guidance (MDNR, 2005) were also completed. Checklist A consists of seven questions to evaluate whether any ecological receptors or habitats are present at or near the site. A positive answer to any of the questions in Checklist A requires completion of Checklist B; which determines if any pathways are complete for any of the receptor(s) identified in Checklist A.

The oxbow of the Blue River was identified as a potential surface water receptor in Checklist A; therefore, Checklist B was also completed. Checklist B consists of seven questions to evaluate the completion of potential migration or exposure pathways. The ecological conceptual site model (ECSM) discussed below was utilized to complete Checklist B. The completed Checklists are provided in **Appendix H**.

A request was submitted to the Missouri Department of Conservation (MDOC) for information regarding endangered or threatened species and communities/habitats of conservation concern on or near the site. The MDOC responded with a Heritage Review Report (MDOC, 2005) that concluded there were no species or habitats of concern at the site. Correspondence from the MDOC is provided in **Appendix I**.

5.2.2 *Constituents of Potential Ecological Concern*

Surface water and sediment samples were collected from the oxbow. Based on constituents detected on-site in the past, the surface water and sediment samples were analyzed for VOCs and metals. No VOCs were detected in any of the samples. The results of these samples were evaluated to assess the current potential impacts to the oxbow and are discussed in Section 5.3.1.

To address future potential impacts to off-site, downgradient receptors of the oxbow, groundwater transport modeling was conducted. All groundwater constituents that exceeded PRGs were selected as COPCs for the groundwater modeling evaluation. The following six VOCs and four metals were selected as the COPCs for the evaluation of shutting down the groundwater remediation system:

- TCE
- benzene
- vinyl chloride
- 1,4-dioxane
- cis-1,2-DCE
- MTBE

- arsenic
- cadmium
- manganese
- lead

The results from the modeling of the above constituents were reviewed to determine which groundwater COPCs may be constituents of potential ecological concern (COPECs). This evaluation is also discussed in Section 5.3.1.

5.2.3 Ecological Site Conceptual Model

As discussed previously, impacted soils from past activities at the site were excavated in 2000 during removal activities. As on-site land use is commercial/industrial, with all areas either maintained grass, pavement, or buildings, no suitable wildlife habitat exists; therefore no on-site exposure of wildlife receptors to chemicals in soil is expected to occur. The secondary source of COPCs are releases to groundwater. Since the depth to groundwater is approximately 15 feet bgs and has not been documented to be discharging to the ground surface, no exposure of wildlife receptors to chemicals in groundwater is expected to occur.

Groundwater flows from the site to the west in the direction of the nearest surface water, which is an oxbow of the Blue River approximately 700 feet to the west of the site. The Blue River main channel is approximately 1900 feet west of the site. Stream use classification of the Blue River near the vicinity of the site is industrial. Based on the regional flow direction and the location of these surface waters, there is a potential for shallow groundwater (i.e., A zone) to migrate from beneath the site and discharge to the oxbow. However, this potential migration pathway has not been confirmed.

For purposes of this ecological risk assessment, the following conceptual model assumptions were made:

- The groundwater extraction system at the site boundary is controlling groundwater on site and preventing further off-site migration.
- Only groundwater downgradient from the extraction system could potentially discharge to downgradient surface waters.
- The nearest potential point of exposure would be the oxbow portion of the Blue River, which is approximately 700 feet downgradient from the site.

Water levels in the oxbow vary greatly, from a few inches to a few feet or more, depending upon seasonal water fluctuations. Although originally constructed with stone riprap and concrete barriers, sedimentation from surface runoff has occurred, allowing the establishment of vegetation to the point that, natural succession appears to be progressing within the oxbow: filling in with cattails, increasing sedimentation, and soil development. There is a potential for aquatic life, such as plankton, macroinvertebrates, fish, and aquatic macrophytes, to be exposed to site-related constituents in shallow groundwater if groundwater from the site discharges to the oxbow. Terrestrial animals drinking from or foraging in the oxbow areas could also be exposed; however, wildlife is not restricted from roaming and potential exposures are not limited to the oxbow area downgradient of the site. **Table 5-1** summarizes the Ecological Exposure Pathways.

5.2.4 Assessment and Measurement Endpoints

Assessment endpoints are any adverse effects on ecological receptors. For example, adverse effects on populations can be inferred from measures related to impaired reproduction, growth, and survival. Adverse effects on communities or habitats are more difficult to measure. The majority of the available screening ecotoxicity values are based on generic assessment endpoints that are widely applied. Assessment endpoints for the site are aquatic (water-column and benthic) invertebrate growth, reproduction and survival.

Measurement endpoints consist of ecological screening levels or ecotoxicity thresholds and include:

- Comparison of surface water sample concentrations to criteria or benchmarks for aquatic life and benthic invertebrates; and
- Comparison of sediment concentrations to sediment quality guidelines (SQGs).

5.2.5 Ecological Effects Evaluation

The preliminary ecological effects evaluation consists of the selection of ecological screening levels and establishment of contaminant exposure levels that represent conservative thresholds for adverse ecological effects, called screening ecotoxicity values (ETVs).

Sources for surface water criteria included EPA's National Ambient Water Quality Criteria (AWQC) (EPA, 2006), Missouri's Water Quality Criteria (WQC) (10 CSR 20-7.031) and relevant peer-reviewed literature. Most WQC are based on dissolved concentrations.

Generic sediment screening levels represent consensus-based sediment quality guidelines (SQGs) obtained from MacDonald et al (MacDonald, 2000). The threshold effect concentrations

(TEC) are concentrations of sediment contaminants below which adverse effects on sediment-dwelling organisms are not expected to occur. The probable effects concentration (PEC) is that concentration above which adverse effects are likely to be observed.

5.2.6 Results of Ecological Screening Level Comparison

Ten sediment and ten surface water samples were collected at co-located sites within the oxbow (see **Figure 5**). In addition, upstream and downstream surface water samples were collected from the Blue River. Sediment and surface water samples were analyzed for VOCs, metals and 1,4-dioxane using low detection limits. 1,4-dioxane was not detected above laboratory quantitation limits in any of the samples collected during this field activity. Laboratory quantitation limits for 1,4-dioxane were 1.0 µg/L for aqueous samples and 0.01 mg/kg for sediment samples. No organic compounds were detected above laboratory quantitation limits in either surface water or sediment samples. Laboratory reports are provided in **Appendix D**. These results were used to evaluate current and on-going remediation system conditions.

To evaluate future conditions assuming the groundwater remediation system is shut-down, the modeled groundwater concentrations (**Appendix G**) were used to compare to ecological screening levels.

Analytes found to have concentrations greater than the screening ETVs (e.g., WQOs) were considered to be of potential ecological concern and selected for additional evaluation. If the analyte concentrations were less than the ETVs, they were excluded from further analysis.

5.2.6.1 Surface Water Screening

Surface water results for total and dissolved metals are provided in **Table 5-2a**. In the Blue River samples, total barium was 120 µg/L in the upstream sample and 130 µg/L in the downstream sample. Dissolved barium was 100 µg/L in the upstream sample and 110 µg/L in the downstream sample. Total manganese in the river samples was 130 µg/L in the upstream sample and 310 µg/L in the downstream sample. No other metals were detected above laboratory quantitation limits in the Blue River samples.

Of the 10 metals analyzed for, arsenic, cadmium, mercury, nickel, and silver were not detected in the oxbow or Blue River surface water samples (**Table 5-2b**). Detected concentrations of barium, chromium, lead, manganese, and selenium were compared to background levels. Background levels included the upgradient surface water sample from the Blue River. Those analytes detected greater than background levels were compared to generic AWQC.

The low concentrations of total barium (110 to 230 $\mu\text{g/L}$), dissolved barium (94 to 110 $\mu\text{g/L}$), total chromium (less than 10 to 12 $\mu\text{g/L}$), total selenium (less than 10 to 17 $\mu\text{g/L}$), and dissolved selenium (less than 10 to 16 $\mu\text{g/L}$) were found to be comparable to the upgradient Blue River samples. That is, the average concentrations (calculated using the detection limit for non-detect results) were similar to the background levels.

Total lead (less than 5 to 39 $\mu\text{g/L}$), total manganese (340 to 1,800 $\mu\text{g/L}$), and dissolved manganese (less than 10 to 280 $\mu\text{g/L}$) were detected in the surface water samples from the oxbow at concentrations greater than the upgradient Blue River samples. The MDC of total lead exceeds the chronic AWQC for lead of 2.5 $\mu\text{g/L}$ and the Missouri WQC of 3 $\mu\text{g/L}$.

There is no established AWQC for manganese. The Missouri WQC of 50 $\mu\text{g/L}$ is the groundwater contaminant criteria; therefore it is not an ecological screening level. A marine life AWQC for manganese was provided in EPA's Quality Criteria for Water, referred to as the Gold Book. However, the Gold Book states that, "Manganese is not considered to be a problem in fresh water."

5.2.6.2 Sediment Screening

A comparison of metals detected in sediment samples to screening levels is provided in **Table 5-3**. Silver was non-detect at a detection limit of 0.25 mg/kg. Low concentrations of arsenic (3.1 to 5.5 mg/kg), barium (99 to 130 mg/kg), cadmium (less than 0.25 to 0.44 mg/kg), chromium (10 to 15 mg/kg), lead (17 to 51 mg/kg), manganese (200 to 340 mg/kg), mercury (0.023 to 0.11 mg/kg), nickel (18 to 27 mg/kg), and selenium (5.1 to 7.4 mg/kg) were detected in sediment samples. For comparison purposes, the applicable Missouri soil background levels are also provided in the table.

The MDC of constituents in sediments were below the TEC SQGs, except lead, nickel, and selenium. However for lead and nickel, the mean concentrations were less than the TEC and the MDCs were less than the PECs. Although selenium concentrations were found to be greater than the generic SQGs, selenium was not detected at concentrations significantly above upgradient in the surface water samples and is not a COPC at the site.

5.2.6.3 Groundwater to Oxbow Modeling Screening

As described in Section 4.2.4.1, estimated COPC groundwater concentrations potentially reaching the oxbow were modeled using Biochlor and Domenico models. To account for the discharge and dilution of groundwater into the oxbow, a dilution factor of 0.11 was applied. The comparison of potential future surface water concentrations to the generic WQC are provided in

Table 5-4. In addition to the WQC described above, additional sources reviewed for WQC included National Oceanographic and Atmospheric Administration's (NOAA) Screening Quick Reference Tables, or SQUIRTs, that present screening concentrations for inorganic and organic contaminants in various environmental media (Buchman, 1999) and EPA's Ecotox Thresholds (ETs) (EPA, 1996).

Water quality criteria are not available for the VOCs, cis-1,2-DCE, 1,4-dioxane, MTBE, and vinyl chloride; however the modeled concentrations for cis-1,2-DCE and vinyl chloride are non-measurable. Of the remaining six COPCs all estimated surface water concentrations were less than screening WQC, except lead and manganese.

5.2.6.4 Surface Water and Sediment Sample Screening Summary

While lead and manganese were detected at levels above the WQC (or other generic screening levels) in surface water samples collected from the oxbow, these inorganics may be background related and associated with either inflow entering the oxbow or from naturally occurring inorganics present in surrounding soils or sediments. Also, lead and manganese are expected to be somewhat immobile, as these constituents' K_d values (50.1 and 890 liters/kilogram, respectively) are elevated. Additional investigation of seasonal trends of lead and manganese in surface water of the oxbow would be needed to verify the likelihood of upstream background impacts.

All detected analytes in sediment samples were found to be less than generic SQGs, except for selenium. However, selenium was not detected at concentrations significantly above upgradient in the surface water samples and is not a COPC at the site.

For the future groundwater remediation system shut-down scenario, all modeled surface water concentrations were estimated to be below available WQC, except lead and manganese. As stated above, these inorganics may be associated with surrounding land uses of the oxbow, rather than site-related.

5.3 Uncertainty Analysis

The SLERA presents a conservative estimate of potential risks and therefore, is intended to overestimate potential ecological risks that may be associated with the site. A few key uncertainties associated with this SLERA are discussed below.

The habitat descriptions included in this assessment are qualitative and based on limited information and visual observations during sampling activities.

This SLERA relies primarily on comparison of maximum detected concentrations in various media with ecological benchmarks. While this approach is customary for a SLERA, it is very conservative since the maximum detected concentration is typically not representative of the exposure medium.

The detection limits for lead in surface water was 0.005 mg/L; which is above the AWQC of 0.0025 mg/L. All evaluations were made using the maximum detected concentration or assuming the non-detects were present at the detection limit. Thus, this resulted in an overestimation of potential risks.

Lead and manganese in surface water were detected at levels above upgradient levels. Additional information would be required to further evaluate:

- a) whether these analytes are associated with naturally occurring levels;
- b) are related to off-site source areas; or
- c) related to groundwater levels.

The SLERA was consistently conservative in selecting literature values, however, there are numerous uncertainties associated with the derivations of the benchmark values. The primary objective for the use of benchmarks is to overestimate rather than underestimate risk, so screening values are always designed to be conservative and health protective. Benchmarks are not available for all constituents. For example, water quality criteria are not available for the VOCs, cis-1,2-DCE, 1,4-dioxane, MTBE, and vinyl chloride. However, these constituents are not likely to pose a significant threat to ecological receptors at the low concentrations estimated at the oxbow.

5.4 Scientific Management Decision Point

The Scientific-Management Decision Point (SMDP) is made at the end of the screening-level assessment; typically after the risk characterization. However, for this SLERA a risk characterization step was not necessary. Based on the conservative assessment conducted using available information, the decision at this point is:

- Although ecological risks are non-existent at the site and may be very low off-site at the oxbow, additional information would be required to evaluate whether analyte concentrations in surface water are site-related. .

6.0 Summary and Conclusions

This HHRA/SLERA was prepared in accordance with applicable EPA risk assessment guidance documents and references.

The risk assessment was conducted using a tiered approach. The tiered process consisted of initially conducting a risk-based screening evaluation of data using applicable or appropriate standards or available risk-based cleanup goals. The MDCs of all detected constituents were used in the risk-based screening evaluations and EPCs based on 95% UCLs were used to calculate risk estimates. Data from soil, groundwater, surface water and sediment were evaluated. Screening levels for soil and groundwater were obtained from USEPA Region 9 PRGs. Surface water and sediment screening levels were obtained from USEPA and NOAA.

Groundwater beneath the site contains concentrations of constituents that are greater than Region 9 PRGs for domestic use of groundwater, suggesting that potable use of groundwater from the site may pose unacceptable health risks. Currently, groundwater is not being used for domestic or industrial purposes; nor is it likely to be used as a potable source in the future. On-site and off-site groundwater is being remediated by the extraction system and subject to the on-going monitoring program.

The residential groundwater screening values (i.e., the PRGs for tap water) are based on ingestion of and inhalation of volatile constituents during the potable use of water. However, impacted groundwater is not used as a domestic water source, nor is its use anticipated in the future. Thus, the use of the PRGs as screening levels for groundwater provides an overly conservative screening of the groundwater pathway, and at the same time, demonstrates that existing site concentrations may result in unacceptable health risks if site groundwater was used as a potable source.

Based on the available data and current site conditions, the findings of this assessment are provided below:

- Future construction workers were evaluated for exposures to subsurface soil during construction activities. Exposure routes included ingestion, dermal, and inhalation (vapor emissions and particulates) to COPCs in soil, and dermal contact and inhalation of COPCs volatilizing ambient air. Risk estimates were calculated for construction worker exposures to COPCs in subsurface soil from Off-Site Area 1 and summarized in **Table 4-27**. The estimated non-carcinogenic hazard index was less than 1.0. The total

cancer risk associated with these exposures was estimated to be 2×10^{-6} , which is within EPA's target risk range of 1×10^{-4} to 1×10^{-6} . Therefore, no adverse health risks are expected for potential construction worker soil exposures.

- Potential adverse health risks were evaluated for current/future off-site commercial/industrial indoor worker scenario in Off-Site Area 1. Risk estimates were calculated for commercial indoor worker exposures to COPCs in surface soil and volatilized COPCs from subsurface soil and groundwater to indoor air. Risk estimates are summarized in **Table 4-28**. The estimated non-carcinogenic hazards were all less than 1.0. For the indoor worker, the estimated excess lifetime cancer risks were 1×10^{-7} for the soil ingestion route, 1×10^{-10} for the subsurface soil inhalation (indoor air vapor intrusion) route, and 6×10^{-8} for the groundwater inhalation (indoor air vapor intrusion) route. Thus, the total estimated excess lifetime risk for the indoor worker scenario was calculated to be 2×10^{-7} , which is less than EPA's target risk range of 1×10^{-4} to 1×10^{-6} .
- Risk estimates were calculated for outdoor worker exposures to COPCs in shallow subsurface soils from Off-Site Area 1, as well. Risk estimates are summarized in **Table 4-28**. The estimated non-carcinogenic hazards were below the level of concern of 1 and, therefore, do not indicate any potential for adverse health effects for off-site commercial/industrial outdoor workers. The total cancer risk associated with potential outdoor worker exposures was estimated to be 4×10^{-5} , which is within EPA's target risk range of 1×10^{-4} to 1×10^{-6} .
- In those areas above where LNAPL has been detected, there currently are no buildings downgradient or less than 100 feet from the source area; and thus the current exposure pathway is incomplete. If buildings are constructed and occupied in areas above LNAPL, it is possible that exposures via the groundwater to indoor air pathway may result in significant human health risks for receptors in these hypothetical buildings. However, the possibility of a future building being constructed over the LNAPL area is limited due to the in place Land Use Restriction.
- Potential inhalation exposures from COPCs in off-site groundwater (from Off-Site Area 2) volatilizing to indoor air for off-site residents were evaluated. The estimated non-carcinogenic hazards and cancer risks associated with these exposures were less than EPA's acceptable risk range (10^{-4} to 10^{-6}) for the protection of human health for off-site residents.

- Surface water and sediment samples were collected from the oxbow and analyzed for VOCs, 1,4-dioxane, and metals. No COPCs were selected from the sediment samples. Lead and manganese were retained as COPCs in surface water. The potential risks associated with these COPCs were evaluated under off-site recreational user scenario using the modeled groundwater results (see below).
- Groundwater fate and transport modeling was conducted to evaluate groundwater conditions and subsequent exposures under a post-remediation shut-down scenario. This groundwater evaluation consisted of using the Domenico and BIOCHLOR Models to estimate downgradient concentrations at potential exposure points (i.e., the oxbow). The modeled groundwater concentrations were used to evaluate a potential future recreational user exposure scenario.
 - A recreational user scenario of the oxbow assuming potential exposures to COPCs in groundwater migrating to surface water was evaluated. These estimates are summarized in **Tables 4-24, 4-25, and 4-26**. The estimated non-carcinogenic hazards and cancer risks associated with these exposures were less than or within EPA's default risk levels.
- The QAS site is an industrial property located within an industrial and commercial area of Blue Summit, Missouri. Due to land use and urbanization of the area, there is limited environment for natural areas and wildlife on and near the site.
 - While lead and manganese, were detected at levels above the WQC in surface water samples collected from the oxbow. The WQC for manganese is not ecologically based and the Gold Book indicated that manganese is not a significant concern for freshwater habitats. While these inorganics are likely background related and associated with either inflow entering the oxbow or from naturally occurring inorganics present in surrounding soils or sediments, additional information would be necessary to substantiate the potential sources.
 - All detected analytes in sediment samples were found to be less than generic SQGs, except for selenium. However, selenium was not detected at concentrations significantly above upgradient in the surface water samples and is not a COPC at the site.
 - For the future groundwater remediation system shut-down scenario, all modeled surface water concentrations were estimated to be below available WQC, except lead and manganese.

7.0 References

- American Society for Testing and Materials (ASTM) 2002. Standard Guide for Risk-Based Corrective Action Applied at Petroleum Release Sites, Designation: E 1739-95 (Reapproved 2002).
- Buchman, M.F., 1999. NOAA Screening Quick Reference Tables, NOAA HAZMAT Report 99-1, Seattle WA, Coastal Protection and Restoration Division National Oceanic and Atmospheric Administration, 12 pages. Updated 2006.
- Domenico, P.A, 1987. "An Analytical Model for Multidimensional Transport of a Decaying Contaminant Species" (J. Hydrology 91, 49-58).
- Dragun, James, 1988. The Soil Chemistry of Hazardous Materials. Hazardous Materials Control Research Institute, Silver Spring, MD.
- Environmental Quality Management, Inc. (EQM), 2004. User's Guide for Evaluating Subsurface Vapor Intrusion Into Buildings, prepared for U.S. Environmental Protection Agency, Office of Emergency and Remedial Response, under EPA Contract Number: 68-W-02-33, Work Assignment No. 004. February.
- Gerald L. Feder, 1979. "Geochemical Survey of Missouri – Geochemical Survey of Waters of Missouri". USGS Professional Paper 954-E.
- Hazardous Substance Data Bank (HSDB), 2005. United States National Library of Medicine, Toxnet, Toxicology Data Network. HSDB. <http://toxnet.nlm.nih.gov/cgi-bin/sis/search>.
- MacDonald, D., C.G. Ingersoll, and T.A. Berger. 2000. Development and Evaluation of Consensus-Based Sediment Quality Guidelines for Freshwater Ecosystems, Arch. Environ. Contam. Toxicol. 39, 20-31 (2000).
- Missouri Department of Conservation (MDOC), 2005. Heritage Review Report, Policy Coordination Unit, Jefferson City, MO, September.
- MDNR, 2000. Rules of Missouri Department of Natural Resources (MDNR) Division 20 - Clean Water Commission, Chapter 7 - Water Quality (10 CSR 20-7.031). August.
- MDNR. 2004. Missouri Risk-Based Corrective Action Process for Petroleum Storage Tanks. February.
- MDNR. 2005. Missouri Risk-Based Corrective Action (MRBCA) Technical Guidance Document. September.
- Shacklette, Hansford T. and Boerngen, Josephine, 1984. Element Concentrations in Soil and the Surficial Materials of the Conterminous United States. U.S.G.S. Professional Paper 1270.
- Shaw, 2004. Surface Water Sampling Work Plan, Quality Analytical Services, 1633 March Avenue, Blue Summit, MO. August 2.
- Shaw, 2005. Human Health and Environmental Risk Assessment Work Plan, Quality Analytical Services Site, 1633 March Avenue, Blue Summit, MO. May 16.

- Tidball, Ronald, R., 1984, Geochemical Survey of Missouri: Geography of Soil Geochemistry and Classification by Factor Analysis of Missouri Agricultural Soils (USGS Professional Paper 954-H, I.).
- United States Environmental Protection Agency (USEPA), 1985. Health Assessment Document for Trichloroethylene, EPA/600/8-82/006F.
- USEPA, 1989. Risk Assessment Guidance for Superfund, Volume I: Human Health Evaluation Manual, (Part A). Office of Emergency and Remedial Response, Washington DC.
- USEPA, 1991a. Risk Guidance for Superfund, Volume I: Human Health Evaluation Manual, Supplemental Guidance, "Standard Default Exposure Factors", Interim Final. Office of Emergency and Remedial Response, Washington, DC.
- USEPA, 1991b. Risk Assessment Guidance for Superfund, Volume I, Human Health Evaluation Manual, (Part B): Development of Risk-Based Preliminary Remediation Goals. Office of Solid Waste and Emergency Response, Washington, DC.
- USEPA, 1995a. Screening Procedures for Estimating the Air Quality Impact of Stationary Sources. EPA-450/R-92-019.
- USEPA, 1996. Ecotox Thresholds (ETs) from ECO Update Interim Bulletin, Volume 3, Number 2, USEPA, Office of Solid Waste and Emergency Response. Publication 9354.0-12FSI, EPA 540/F-95/038, NTIS PB95-963324. January 1996.
- USEPA, 1997. Exposure Factors Handbook. EPA/600/P-95/002Fa.
- U. S. EPA. 1997b. *Ecological Risk Assessment Guidance for Superfund, Process for Designing and Conducting Ecological Risk Assessments*, Interim Final. EPA 540-R-97-006, OSWER Directive # 9285.7-25. www.epa.gov/superfund/programs/risk/ecorisk/ecorisk.htm
- USEPA, 1998. Risk Assessment Guidance for Superfund, Volume I, Human Health Evaluation Manual (Part D): Standardized Planning, Reporting, and Review of Superfund.
- U.S. EP A. 1998b. *Guidelines for Ecological Risk Assessment*, Final. EPA/630/R-95/002F. www.epa.gov/ncea/ecorsk.htm
- USEPA, 2001a. Supplemental Guidance for Developing Soil Screening Levels for Superfund Sites. Peer Review Draft. OSWER 9355.4-24. March 2001.
- USEPA, 2001b. Trichloroethylene Health Risk Assessment: Synthesis and Characterization (External Review Draft). U.S. Environmental Protection Agency, Office of Research and Development, National Center for Environmental Assessment, Washington Office, Washington, DC, EPA/600/P-01/002A, 2001.
- USEPA, 2002. Draft Guidance for Evaluating the Vapor Intrusion to Indoor Air Pathway from Groundwater and Soils. Office of Solid Waste and Emergency Response (OSWER), November.
- USEPA, 2002. User's Guide for the Johnson and Ettinger (1991) Model for Subsurface Vapor Intrusion into Buildings (Revised), Office of Superfund Risk Assessment, August 2002 revision: http://www.epa.gov/superfund/programs/risk/airmodel/johnson_ettinger.htm
- USEPA, 2003, EPA Region III Risk -Based Concentration Table: Technical Background Information, Revised 4/16/2003, <http://www.epa.gov/reg3hwmd/risk/human/info/tech.htm>

USEPA, 2003b, Human Health Toxicity Values in Superfund Risk Assessment Memorandum, OSWER Directive 9285.7-53, Office of Solid Waste and Emergency Response, December 5, 2003.

USEPA, 2004, ProUCL Version 3.0 User Guide. Office of Research and Development. EPA/600/R04/0790. April 2004.

USEPA, 2004. Risk Assessment Guidance for Superfund, Volume I: Human Health Evaluation Manual. (Part E, Supplemental Guidance for Dermal Risk Assessment), Interim Guidance. Office of Emergency and Remedial Response, Washington, D.C. July.

USEPA, 2004. EPA Region 9 Preliminary Remediation Goals (PRGs) Tables. <http://www.epa.gov/region09/waste/sfund/prg/files/04prgtable.pdf>.

USEPA, 2006a. 2006 Edition of the Drinking Water Standards and Health Advisories, EPA 822-R-06-013, Office of Water, U.S. Environmental Protection Agency, Washington DC, August, 2006.

USEPA, 2006b. EPA National Recommended Water Quality Criteria, Office of Water, U.S. Environmental Protection Agency, 2004.

USEPA, 2007. Integrated Risk Information System (IRIS) Database, Last updated January 25, 2007. <http://www.epa.gov/iris/index.html>

TABLES

TABLE 3-1
SUMMARY OF DETECTED VOLATILE ORGANIC COMPOUNDS IN SOILS
QUALITY ANALYTICAL SERVICES SITE
BLUE SUMMIT, MO

BORING	DEPTH	SAMPLE DATE	Units	Acetone	Chloromethane	Methylene Chloride	1,1,2,2-Tetra-chloroethane	Xylenes	Toluene
97B1	4"	13-Oct-97	mg/kg	0.50 U	0.05 U	0.05 U	15.30	0.0625 U	0.0625 U
97B6	10'	20-Oct-97	mg/kg	0.50 U	66.90 J	0.05 U	0.0125 U	0.0625 U	0.0625 U
97B8	25'	22-Oct-97	mg/kg	0.50 U	0.05 U	78.40	0.0125 U	0.0625 U	0.0625 U
97B8	29'	22-Oct-97	mg/kg	0.50 U	0.05 U	0.05 U	17.90	0.0625 U	0.0625 U
97B13	6"	11-Nov-97	mg/kg	0.50 U	0.05 U	0.05 U	0.0125 U	0.0625 U	68.50
97B13	DUP	11-Nov-97	mg/kg	0.50 U	0.05 U	0.05 U	0.0125 U	0.0625 U	96.00
97B14	6"	24-Nov-97	mg/kg	0.50 U	0.05 U	60.50	0.0125 U	0.0625 U	0.0625 U
97B14	5'	24-Nov-97	mg/kg	0.50 U	0.05 U	76.30	0.0125 U	0.0625 U	0.0625 U
97B14	10'	24-Nov-97	mg/kg	0.50 U	0.05 U	83.50	0.0125 U	0.0625 U	0.0625 U
97B14	11'	24-Nov-97	mg/kg	0.50 U	0.05 U	74.10	0.0125 U	0.0625 U	0.0625 U
97B14	15'	24-Nov-97	mg/kg	0.50 U	0.05 U	109.0	0.0125 U	0.0625 U	0.0625 U
97B14	20'	24-Nov-97	mg/kg	0.50 U	0.05 U	113.0	0.0125 U	0.0625 U	0.0625 U
97B14	24'	24-Nov-97	mg/kg	0.50 U	0.05 U	77.40	0.0125 U	0.0625 U	0.0625 U
97B15	6"	25-Nov-97	mg/kg	0.50 U	0.05 U	73.40	0.0125 U	0.0625 U	0.0625 U
97B15	5'	25-Nov-97	mg/kg	0.50 U	0.05 U	95.50	0.0125 U	0.0625 U	0.0625 U
97B15	10'	25-Nov-97	mg/kg	0.50 U	0.05 U	111.0	0.0125 U	0.0625 U	0.0625 U
97B15	DUP	25-Nov-97	mg/kg	0.50 U	0.05 U	87.50	0.0125 U	0.0625 U	0.0625 U
97B16	6"	26-Nov-97	mg/kg	0.50 U	0.05 U	74.40	0.0125 U	0.0625 U	0.0625 U
97B16	5'	26-Nov-97	mg/kg	1070	0.05 U	78.10	0.0125 U	0.0625 U	0.0625 U
97B16	10'	26-Nov-97	mg/kg	0.5 U	0.05 U	63.60	0.0125 U	0.0625 U	0.0625 U
97B16	22'	26-Nov-97	mg/kg	876	0.05 U	0.05 U	0.0125 U	0.0625 U	0.0625 U
98B18	7.5'	11-Mar-98	mg/kg	0.50 U	0.05 U	0.05 U	0.0125 U	0.2400	0.0625 U
98B19	15.0'	11-Mar-98	mg/kg	0.50 U	0.05 U	0.05 U	0.0191	0.0625 U	0.0625 U

Definitions:

mg/kg = Milligrams per kilogram

J = Value is estimated

U = Undetected at method detection limit

B18 Shaded borings located inside QAS building.

Only locations with detections are included in the summary table. All other locations were non-detect.

TABLE 3-2
ANALYTICAL RESULTS FOR SVOCs, PESTICIDES, and HEX CHROMIUM
BORINGS BENEATH THE ON-SITE BUILDING

CHEMICAL	Date Collected	Units	B17R - 0.5'	B17R - 2.5'	B17R - 5.0'	B17R - 7.5'	B18R - 0.5'	B18R - 2.5'	B19R - 0.5'	B19R - 2.5'	B19R - 5.0'	B19R - 7.5'	B19R - 10.0'	B19R - 12.5'	B19R - 15.0'
SEMI-VOLATILE ORGANIC COMPOUNDS															
Acenaphthene	25-Aug-00	ug/kg	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
Anthracene	25-Aug-00	ug/kg	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	62(J)
Benzoic acid	25-Aug-00	ug/kg	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
Benzo(a)anthracene	25-Aug-00	ug/kg	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
Bis(2-ethylhexyl)phthalate	25-Aug-00	ug/kg	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	210(J)
Chrysene	25-Aug-00	ug/kg	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
2,4-Dimethylphenol	25-Aug-00	ug/kg	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
Dibenzofuran	25-Aug-00	ug/kg	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
1,2-Dichlorobenzene	25-Aug-00	ug/kg	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
1,4-Dichlorobenzene	25-Aug-00	ug/kg	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
2,4-Dinitrotoluene	25-Aug-00	ug/kg	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
Hexachlorobenzene	25-Aug-00	ug/kg	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
Hexachloroethane	25-Aug-00	ug/kg	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
Hexachlorobutadiene	25-Aug-00	ug/kg	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
Fluoranthene	25-Aug-00	ug/kg	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
Fluorene	25-Aug-00	ug/kg	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
2-Methylnaphthalene	25-Aug-00	ug/kg	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
2-Methylphenol	25-Aug-00	ug/kg	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
Nitrobenzene	25-Aug-00	ug/kg	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
Naphthalene	25-Aug-00	ug/kg	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
3-Methylphenol	25-Aug-00	ug/kg	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
Butyl benzyl phthalate	25-Aug-00	ug/kg	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
p-Cresol (4-methylphenol)	25-Aug-00	ug/kg	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
Pyradine	25-Aug-00	ug/kg	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
Di-n-butylphthalate	25-Aug-00	ug/kg	ND	ND	54(J)	ND	ND	60(B,J)	ND	ND	ND	100(B,J)	42(B,J)	ND	140(B,J)
N-Nitrosodiphenylamine	25-Aug-00	ug/kg	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
Phenanthrene	25-Aug-00	ug/kg	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
Phenol	25-Aug-00	ug/kg	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
Pyrene	25-Aug-00	ug/kg	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
PESTICIDES															
beta-BHC	25-Aug-00	ug/kg	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
gamma-BHC	25-Aug-00	ug/kg	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
Heptachlor	25-Aug-00	ug/kg	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
Heptachlor epoxide	25-Aug-00	ug/kg	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
METALS															
Hexavalent Chrome	25-Aug-00	mg/kg	0.258	0.203	0.641	1.02	0.367	0.137	0.418	0.299	0.465	0.685	0.47	0.718	0.816

ug/kg = microgram per kilogram
ND = not detected

(B)-Analyte is found in the associated blank
(J)-Detected but below the PRL; result is estimated

TABLE 3-2
ANALYTICAL RESULTS FOR SVOCs, PESTICIDES, and HEX CHROMIUM
BORINGS BENEATH THE ON-SITE BUILDING

CHEMICAL	Date Collected	Units	B19R - 17.5'	B19R - 20.0'	DUPLICATE
SEMI-VOLATILE ORGANIC COMPOUNDS					
Acenaphthene	25-Aug-00	ug/kg	ND	ND	ND
Anthracene	25-Aug-00	ug/kg	ND	ND	ND
Benzoic acid	25-Aug-00	ug/kg	ND	ND	ND
Benzo(a)anthracene	25-Aug-00	ug/kg	ND	ND	ND
Bis(2-ethylhexyl)phthalate	25-Aug-00	ug/kg	ND	ND	ND
Chrysene	25-Aug-00	ug/kg	ND	ND	ND
2,4-Dimethylphenol	25-Aug-00	ug/kg	ND	ND	ND
Dibenzofuran	25-Aug-00	ug/kg	ND	ND	ND
1,2-Dichlorobenzene	25-Aug-00	ug/kg	ND	ND	ND
1,4-Dichlorobenzene	25-Aug-00	ug/kg	ND	ND	ND
2,4-Dinitrotoluene	25-Aug-00	ug/kg	ND	ND	ND
Hexachlorobenzene	25-Aug-00	ug/kg	ND	ND	ND
Hexachloroethane	25-Aug-00	ug/kg	ND	ND	ND
Hexachlorobutadiene	25-Aug-00	ug/kg	ND	ND	ND
Fluoranthene	25-Aug-00	ug/kg	ND	ND	ND
Fluorene	25-Aug-00	ug/kg	ND	ND	ND
2-Methylnaphthalene	25-Aug-00	ug/kg	ND	ND	ND
2-Methylphenol	25-Aug-00	ug/kg	ND	ND	ND
Nitrobenzene	25-Aug-00	ug/kg	ND	ND	ND
Naphthalene	25-Aug-00	ug/kg	ND	ND	ND
3-Methylphenol	25-Aug-00	ug/kg	ND	ND	ND
Butyl benzyl phthalate	25-Aug-00	ug/kg	ND	ND	ND
p-Cresol (4-methylphenol)	25-Aug-00	ug/kg	ND	ND	ND
Pyradine	25-Aug-00	ug/kg	ND	ND	ND
Di-n-butylphthalate	25-Aug-00	ug/kg	90(B,J)	89(B,J)	ND
N-Nitrosodiphenylamine	25-Aug-00	ug/kg	ND	ND	ND
Phenanthrene	25-Aug-00	ug/kg	ND	ND	ND
Phenol	25-Aug-00	ug/kg	ND	ND	ND
Pyrene	25-Aug-00	ug/kg	ND	ND	ND
PESTICIDES					
beta-BHC	25-Aug-00	ug/kg	ND	2.8	ND
gamma-BHC	25-Aug-00	ug/kg	ND	ND	ND
Heptachlor	25-Aug-00	ug/kg	ND	ND	ND
Heptachlor epoxide	25-Aug-00	ug/kg	ND	ND	ND
METALS					
Hexvalent Chrome	25-Aug-00	mg/kg	1.42	1.12	0.581

ug/kg = microgram per kilogram
ND = not detected

(B)-Analyte is found in the associated blank
(J)-Detected but below the PRL; result is estimated

TABLE 3-3
SUMMARY OF DETECTED PESTICIDES AND PCBs IN SOILS
QUALITY ANALYTICAL SERVICES SITE
BLUE SUMMIT, MO

BORING	DEPTH	DATE SAMPLED	CONCENTRATIONS IN mg/kKg		
			beta-BHC	Heptachlor	PCB-1260
97B3	3"	14-Nov-97	0.002 U	0.002 U	0.0790
97B4	3"	20-Oct-97	0.002 U	0.0549	0.002 U
97B5	6"	20-Oct-97	0.002 U	0.0076	0.0987
97B7	4"	21-Oct-97	0.002 U	0.0096	0.0610
	15'	21-Oct-97	0.002 U	0.002 U	0.0278
97B8	5'	21-Oct-97	0.002 U	0.00670	0.002 U
	29'	22-Oct-97	0.002 U	0.00879 J	0.0400
97B9	2"	3-Nov-97	0.002 U	0.002 U	0.0470
	5'	3-Nov-97	0.002 U	0.002 U	0.0173
	10'	3-Nov-97	0.002 U	0.002 U	0.0109
97B10	6"	4-Nov-97	0.002 U	0.002 U	0.0360
	25'	4-Nov-97	0.002 U	0.002 U	0.0124
97B11	6"	5-Nov-97	0.002 U	0.002 U	0.0128
97B12	6"	10-Nov-97	0.002 U	0.002 U	0.0458
	20'	10-Nov-97	0.002 U	0.00285	0.002 U
97B14	10'	24-Nov-97	0.002 U	0.0150 J	0.0357
	11'	24-Nov-97	0.002 U	0.00917 J	0.0687
	20'	24-Nov-97	0.002 U	0.00497 J	0.002 U
97B16	6"	26-Nov-97	0.00881	0.002 U	0.002 U
98B18	7.5'	11-Mar-98	0.004	0.007	0.4450
98B19	0'	11-Mar-98	0.002 U	0.002 U	0.0428
	12.5'	11-Mar-98	0.002 U	0.002 U	0.0730
	15.0'	11-Mar-98	0.002 U	0.002 U	0.0270
	16.8'	11-Mar-98	0.002 U	0.002 U	0.0840

U = Undetected at method detection limit

J = VALUES ARE ESTIMATED

B18 Shaded borings located inside QAS building.

Only locations with detections are included in the summary table. All other locations were non-detect.

TABLE 3-4
SUMMARY OF DETECTED METALS IN SOILS
QUALITY ANALYTICAL SERVICES SITE
BLUE SUMMIT, MO

SAMPLE ID	SAMPLE DATE	UNITS	ARSENIC	BARIUM	BERYLLIUM	CADMIUM	CHROMIUM	COBALT	COPPER	IRON	LEAD	MANGANESE	MERCURY	NICKEL	SILVER	THALLIUM	TIN	VANADIUM	ZINC
97B1-4"	13-Oct-97	mg/Kg	5.0 U	74.6	0.1990	0.929	5.82	1.50 J	6.67 J	4,420	8.37	229	0.075 U	7.10	2,900	0.185 U	2.5 U	10.30	17.70 J
97B2-4"	13-Oct-97	mg/Kg	5.0 U	94.5	0.4430	1.66	10.30	3.24 J	9.53 J	8,620	14.70	415	0.075 U	12.60	2,450	0.185 U	2.5 U	16.90	36.70 J
97B2-2.5'	13-Oct-97	mg/Kg	6.98	175.0	0.9030	2.993	13.40	7.70 J	13.50 J	18,600	16.30	799	0.090	20.20	0.326	0.215	2.5 U	17.10	52.00 J
97B2-7.5'	13-Oct-97	mg/Kg	5.0 U	98.1	0.6150	2.19	12.80	5.63 J	12.20 J	14,100	12.00	351	0.075 U	15.10	0.310	0.185 U	2.5 U	18.10	56.60 J
97B2-10.0'	13-Oct-97	mg/Kg	15.40	107.0	1.120	4.59	23.40	12.10 J	20.30 J	20,400	20.40	439	0.075 U	46.10	0.287	0.395	2.5 U	12.40	195.00 J
97B3-3"	14-Oct-97	mg/Kg	5.0 U	45.5	0.2230 J	0.775	5.57	1.82 J	6.92	5,100	20.10	335 J	ND(0.75) UR	6.96	2.5 U	0.185 U	2.5 U	10.40	29.70 J
97B3-2.5'	14-Oct-97	mg/Kg	6.04	122.0	0.8780 J	2.15	12.70	7.29 J	11.90	14,200	13.90	553 J	ND(0.75) UR	16.50	2.5 U	0.185 U	2.5 U	22.60	40.90 J
97B3-5.0'	14-Oct-97	mg/Kg	6.07	118.0	0.8380 J	1.78	10.50	7.27 J	11.10	14,100	14.60	597 J	0.4070 R	16.00	2.5 U	0.185 U	2.5 U	18.30	39.60 J
97B3-7.0'	14-Oct-97	mg/Kg	5.0 U	139.0	0.6950 J	1.85	10.70	6.83 J	12.40	13,800	16.00	634 J	0.4020 R	14.80	2.5 U	0.185 U	2.5 U	16.80	41.30 J
97B3-10.0'	14-Oct-97	mg/Kg	7.91	174.0	0.7450 J	2.05	11.80	7.36 J	12.40	17,100	14.40	605 J	0.4440 R	14.50	2.5 U	0.185 U	2.5 U	20.20	47.40 J
97B3-12.0'	14-Oct-97	mg/Kg	7.13	118.0	0.6930 J	1.96	9.91	6.71 J	11.80	14,600	13.70	499 J	ND(0.75) UR	16.70	2.5 U	0.185 U	2.5 U	17.10	45.30 J
97B3-15.0'	14-Oct-97	mg/Kg	7.43	144.0	0.7092 J	1.98	9.78	7.28 J	13.20	15,600	14.50	507 J	0.9760 R	17.80	2.5 U	0.211	2.5 U	18.90	51.10 J
97B3-17.5'	14-Oct-97	mg/Kg	6.45	178.0	0.6900 J	2.00	10.30	6.53 J	13.80	13,800	14.10	743 J	ND(0.75) UR	18.00	2.5 U	0.216	2.5 U	17.40	51.10 J
97B3-20.0'	14-Oct-97	mg/Kg	6.34	197.0	0.6500 J	2.15	9.69	7.74 J	13.40	13,000	14.00	1,150 J	ND(0.75) UR	21.80	2.5 U	0.212	2.5 U	16.30	50.50 J
DUPLICATE	14-Oct-97	mg/Kg	5.10	150.0	0.6990 J	1.83	10.80	7.49 J	12.00	13,100	13.70	641 J	0.087	14.10	2.5 U	0.185 U	2.5 U	20.10	43.70 J
97B4-3"	20-Oct-97	mg/Kg	5.0 U	41.7	0.1950	1.09	6.39	1.71 J	10.40	5,120	42.60	251 J	0.075 U	6.62 J	2.5 U	0.185 U	2.5 U	4.28	85.40 J
97B5-6"	20-Oct-97	mg/Kg	5.0 U	146.0	0.3950	1.32	8.88	4.76 J	11.90	7,820	43.40	515 J	0.075 U	13.60 J	2.5 U	0.185 U	2.5 U	9.64	54.60 J
97B6-4"	20-Oct-97	mg/Kg	5.0 U	49.8	0.2850	0.801	7.26	2.44 J	7.19	5,610	12.20	257 J	0.075 U	8.46 J	2.5 U	0.185 U	2.5 U	8.32	27.80 J
97B6-10.0'	20-Oct-97	mg/Kg	16.20	91.4	0.9880	5.23	68.30	8.98 J	58.10	16,800	68.40	208 J	0.178	54.80 J	2.5 U	0.982	2.5 U	389.0	5.34 J
97B7-4"	21-Oct-97	mg/Kg	5.0 U	60.5	0.3150	1.37	7.29	2.85	7.16 J	6,390	26.30	363 J	0.075 U	9.58	2.5 U	0.185 U	2.5 U	9.54	31.80 J
97B7-10.0'	21-Oct-97	mg/Kg	5.51	164.0	0.6910	2.30	10.70	6.90	12.10 J	13,900	14.70	681 J	0.075 U	15.50	2.5 U	0.185 U	2.5 U	18.30	47.60 J
97B8-6"	21-Oct-97	mg/Kg	5.0 U	110.0	0.2500	1.24	7.00	2.00	8.94 J	5,270	15.40	321 J	0.075 U	8.09	2.5 U	0.185 U	2.5 U	7.19	39.70 J
97B8-5"	21-Oct-97	mg/Kg	5.0 U	132.0	0.8870	2.77	16.80	8.48	14.30 J	16,600	18.70	699 J	0.075 U	20.40	2.5 U	0.219	2.5 U	20.10	47.60 J
97B8-10"	21-Oct-97	mg/Kg	5.0 U	166.0	0.8020	2.64	13.50	8.31	13.20 J	15,000	16.70	707 J	0.075 U	20.50	2.5 U	0.185 U	2.5 U	19.40	49.10 J
97B8-15"	21-Oct-97	mg/Kg	5.56	141.0	0.9130	2.78	15.50	8.33	15.00 J	16,500	18.10	803 J	0.075 U	21.20	2.5 U	0.234	2.5 U	22.30	61.40 J
97B8-20"	21-Oct-97	mg/Kg	10.10	251.0	1.0500	3.75	21.20	11.30	21.10 J	23,700	18.20	599 J	0.075 U	28.30	2.5 U	0.185 U	2.5 U	30.50	67.80 J
97B8-25"	22-Oct-97	mg/Kg	5.0 U	75.3	0.6230	1.26	11.80	5.42 J	11.10	9,830	12.30	66	0.075 U	10.20	2.5 U	0.185 U	2.5 U	13.70 J	52.90
97B8-29"	22-Oct-97	mg/Kg	5.0 U	115.0	0.6210	1.80	10.90	5.51 J	10.80	11,500	13.00	219	0.075 U	14.70	2.5 U	0.185 U	2.5 U	16.80 J	64.70
97B9-2"	3-Nov-97	mg/Kg	5.0 U	63.4	0.153 J	6.85	3.41	7.89	7.120	13,10	408	0.075 U	9.20 J	2.5 U	0.185 U	2.5 U	7.48	33.50 J	
97B9-5"	3-Nov-97	mg/Kg	5.72	186.0	0.9630	2.92 J	18.10	8.38	13.40	15,600	18.40	657	0.075 U	21.40 J	2.5 U	0.185 U	2.5 U	23.70	46.10 J
97B9-10.0'	3-Nov-97	mg/Kg	5.25	143.0	0.8430	2.55 J	13.20	8.33	12.50	14,900	17.00	715	0.075 U	20.70 J	2.5 U	0.185 U	2.5 U	19.00	54.90 J
97B9-15.0'	3-Nov-97	mg/Kg	6.48	174.0	0.8320	2.84 J	13.80	8.56	13.40	16,600	14.80	578	0.075 U	20.20 J	2.5 U	0.185 U	2.5 U	19.30	51.90 J
97B9-20.0'	3-Nov-97	mg/Kg	5.95	127.0	0.7470	2.65 J	11.30	8.19	11.80	14,100	15.80	480	0.075 U	16.50 J	2.5 U	0.185 U	2.5 U	18.00	47.80 J
97B9-25.0'	3-Nov-97	mg/Kg	5.93	74.5	0.6960	2.25 J	12.70	7.47	11.80	12,100	16.50	96	0.075 U	13.10 J	2.5 U	0.185 U	2.5 U	16.60	50.50 J
97B10-6"	4-Nov-97	mg/Kg	5.0 U	79.2	0.3830	1.46	8.55	3.19 J	10.10	7,920	24.90	349	0.075 U	10.70	2.5 U	0.185 U	2.5 U	13.20 J	53.90
97B10-5.0'	4-Nov-97	mg/Kg	6.33	150.0	0.9520	3.04	15.70	8.85 J	14.20	17,900	19.10	784	0.075 U	23.20	2.5 U	0.185 U	2.5 U	19.90 J	51.00
97B10-10.0'	4-Nov-97	mg/Kg	7.62	608.0	0.4250	2.92	15.50	10.20 J	15.40	17,500	20.70	706	0.075 U	23.30	2.5 U	0.185 U	2.5 U	20.10 J	66.60
97B10-15.0'	4-Nov-97	mg/Kg	6.58	150.0	0.8480	2.93	16.30	9.29 J	14.50	17,200	15.90	708	0.075 U	23.10	2.5 U	0.185 U	2.5 U	19.50 J	47.70
97B10-20.0'	4-Nov-97	mg/Kg	5.99	157.0	0.6740	2.34	10.60	6.90 J	10.90	13,800	14.60	599	0.075 U	14.80	2.5 U	0.185 U	2.5 U	15.80 J	48.40
97B10-25.0'	4-Nov-97	mg/Kg	8.06	164.0	0.7040	2.45	10.00	7.07 J	12.40	14,200	15.40	628	0.075 U	18.00	2.5 U	0.185 U	2.5 U	17.80 J	56.20
97B11-6"	5-Nov-97	mg/Kg	5.0 U	47.4	0.1160	1.06	5.51	2.51 J	11.60	4,060	19.40	232	0.075 U	8.27	2.5 U	0.185 U	2.5 U	8.75	55.20
97B11-10.0'	5-Nov-97	mg/Kg	6.40	122.0	0.9000	2.53	14.20	7.52 J	11.80	16,300	16.50	621	0.075 U	19.20	2.5 U	0.200	2.5 U	19.30	43.70
97B11-15.0'	6-Nov-97	mg/Kg	5.0 U	115.0	0.7980	2.48	12.40	7.08 J	12.20	13,100	15.40	647	0.075 U	19.70	2.5 U	0.185 U	2.5 U	18.60	49.60
97B11-20.0'	6-Nov-97	mg/Kg	5.58	161.0	0.7020	2.25	10.40	7.04 J	11.10	12,900	13.10	563	0.075 U	16.80	2.5 U	0.185 U	2.5 U	14.90	43.10
97B11-25.0'	6-Nov-97	mg/Kg	5.99	111.0	0.7000	2.27	10.70	8.75 J	10.80	13,800	15.90	809	0.075 U	17.00	2.5 U	0.185 U	2.5 U	18.20	114.60
97B11-30.0'	6-Nov-97	mg/Kg	5.0 U	125.0	0.5500	1.75	8.97	5.79 J	9.86	9,830	136.00	466	0.075 U	12.10	2.5 U	0.185 U	2.5 U	13.90	42.90
97B12-6"	10-Nov-97	mg/Kg	5.0 U	62.9	0.1770	1.41	7.64	2.50 J	12.80	6,580	19.30	411	0.075 U	7.05	2.5 U	0.185 U	2.5 U	10.10	52.40 J
97B12-10.0'	10-Nov-97	mg/Kg	5.0 U	137.0	0.5230	2.86	13.10	5.10 J	25.60	10,400	166.00	415	0.091	15.50	2.5 U	0.185 U	2.5 U	26.10 J	25.30 J
97B12-15.0'	10-Nov-97	mg/Kg	5.76	144.0	0.7950	2.88	14.40	9.30 J	12.80	14,600	16.80	763	0.075 U	19.40	2.5 U	0.185 U	2.5 U	18.00	51.80 J
97B12-20.0'	10-Nov-97	mg/Kg	5.21	160.0	0.6990	2.71	13.30	8.14 J	12.20	13,400	15.60	673	0.075 U	18.30	2.5 U	0.185 U	2.5 U	19.10	55.70 J
97B12-DUP	10-Nov-97	mg/Kg	5.23	158.0	0.6870	2.77	12.20	8.44 J	11.80	13,200	15.50	712	0.075 U	18.90	2.5 U	0.185 U	2.5 U	17.00	63.30 J
97B13-6"	11-Nov-97	mg/Kg	5.0 U	42.0	0.0532	0.822	4.37	1.33 J	6.87	3,620	9.78	301	0.075 U	5.37	4.190	0.185 U	2.5 U	8.29	46.60 J
97B13-10.0'	11-Nov-97	mg/Kg	6.02	148.0	0.7820	2.85	12.20	9.10 J	11.20	14,900	16.50	750	0.075 U	20.90	2.5 U	0.185 U	2.5 U	15.60	56.00 J
97B13-15.0'	11-Nov-97	mg/Kg	5.0 U	131.0	0.7070	2.80	11.90	8.19 J	11.70	14,400	14.50	679	0.075 U	18.10	2.5 U	0.185 U	2.5 U	16.00	60.80 J
97B13-20.0'	11-Nov-97	mg/Kg	7.72	150.0	0.7300	3.20	13.10	7.55 J	13.30	14,600	16.20	551	0.075 U	16.20	2.5 U	0.190	2.5 U	25.70	77.00 J
97B13-25.0'	11-Nov-97	mg/Kg	5.0 U	142.0	0.8290	2.43	12.20	7.14 J	10.80	13,400	13.10	626	0.075 U	16.60	2.5 U	0.185 U	2.5 U	16.70	57.40 J
97B13-30.0'	11-Nov-97	mg/Kg	7.53	177.0	0.4910	2.61	9.67	7.80 J	14.70	12,600	12.10	1,810	0.075 U	25.80	2.5 U	0.395	2.5 U	22.90	74.50 J
97B13-DUP	11-Nov-97	mg/Kg	5.30	107.0	0.6990	2.72	12.00	8.55 J	12.70	13,800	14.40	904	0.075 U	19.50	2.5 U	0.185 U	2.5 U	17.50	47.00 J
97B14-6"	24-Nov-97	mg/Kg	5.95	168.0	0.6930	2.80	10.30	7.03	11.60	14,300	15.80	618	0.075 U	14.60	2.5 U	0.185 U	2.5 U	20.00	57.90
97B14-5.0																			

TABLE 3-4
SUMMARY OF DETECTED METALS IN SOILS
QUALITY ANALYTICAL SERVICES SITE
BLUE SUMMIT, MO

SAMPLE ID	SAMPLE DATE	UNITS	ARSENIC	BARIUM	BERYLLIUM	CADMIUM	CHROMIUM	COBALT	COPPER	IRON	LEAD	MANGANESE	MERCURY	NICKEL	SILVER	THALLIUM	TIN	VANADIUM	ZINC
97B15-15.0'	25-Nov-97	mg/Kg	8.05	185.0	0.556	2.30	7.43	6.14	11.80	10,500	13.50	1,265	0.4490 R	15.40	2.5 U	0.185 U	2.5 U	17.80	46.00
97B15-20.0'	25-Nov-97	mg/Kg	5.0 U	108.0	0.524	1.70	9.37	6.14	10.30	9,990	5.07	238	ND(-075) UR	14.80	2.5 U	0.185 U	2.5 U	14.80	44.00
97B15-22.0'	25-Nov-97	mg/Kg	5.0 U	99.6	0.492	1.25	8.24	4.57	9.62	8,750	9.88	142	0.0760 R	9.54	2.5 U	0.185 U	2.5 U	13.40	48.30
97B15-DUP	25-Nov-97	mg/Kg	7.09	143.0	0.627	2.06	17.30	5.62	11.20	11,900	13.30	472	0.0910	14.10	2.5 U	0.185 U	2.5 U	17.40	51.10
97B16-6"	26-Nov-97	mg/Kg	7.01	361.0	0.834	2.59	12.70	6.66	16.50	14,800	16.50	566	0.0428 R	18.00	2.5 U	0.340	2.5 U	21.00	55.50
97B16-5.0'	26-Nov-97	mg/Kg	7.55	204.0	0.663	2.26	13.80	6.50	12.10	12,300	14.20	799	0.0770 R	16.90	2.5 U	0.200	2.5 U	19.40	48.30
97B16-10.0'	26-Nov-97	mg/Kg	6.05	149.0	0.600	2.21	10.60	5.66	11.70	11,500	13.50	318	ND(-075) UR	13.80	2.5 U	0.270	2.5 U	15.60	54.10
97B16-15.0'	26-Nov-97	mg/Kg	18.0	130.0	0.7286	3.64	10.70	5.12	12.20	21,500	14.20	609	0.1330 R	15.50	2.5 U	0.255	2.5 U	25.20	70.40
97B16-20.0'	26-Nov-97	mg/Kg	5.0 U	88.6	0.5406	1.52	11.90	5.52	9.61	10,240	12.10	67	0.0840 R	14.30	2.5 U	0.185 U	2.5 U	16.60	54.60
97B16-22.0'	26-Nov-97	mg/Kg	5.0 U	77.3	0.493	1.37	9.38	5.52	8.85	8,760	9.70	72	0.0930 R	13.40	2.5 U	0.195	2.5 U	11.60	41.60
98B17-0.0'	10-Mar-98	mg/Kg	6.37	172.0	U	2.46	13.50	6.28	12.20	14,800	11.60	488	0.0780	14.90	1.86	0.246	2.5 U	18.60	40.50
98B17-2.5'	10-Mar-98	mg/Kg	8.37	197.0	U	2.46	11.70	7.26	13.80	16,100	13.50	667	0.075 U	16.60	1.03	0.226	2.5 U	16.50	47.40
98B17-5.0'	10-Mar-98	mg/Kg	7.32	153.0	U	2.28	12.20	7.56	13.40	15,800	13.80	536	0.075 U	16.30	1.07	0.297	2.5 U	17.20	46.50
98B18-0.0'	11-Mar-98	mg/Kg	5.0 U	154.0	U	1.72	10.90	4.29	9.78	11,200	6.91	417	0.075 U	10.40	2.05	0.222	2.5 U	15.10	34.10
98B18-2.5'	11-Mar-98	mg/Kg	6.94	198.0	U	2.67	11.50	7.48	13.30	15,600	13.10	612	0.075 U	17.70	1.01	0.280	2.5 U	15.00	50.90
98B18-5.0'	11-Mar-98	mg/Kg	6.66	186.0	U	2.12	11.10	5.61	12.00	15,400	12.00	405	0.075 U	13.20	1.01	0.333	2.5 U	13.70	47.60
98B18-7.5'	11-Mar-98	mg/Kg	9.01	120.0	U	4.20	20.20	7.72	22.00	15,100	21.10	1,420	0.075 U	40.90	1.06	0.283	2.5 U	41.80	118.00
98B19-0.0'	11-Mar-98	mg/Kg	5.11	165.0	U	2.26	13.40	5.27	12.20	15,300	15.30	380	0.075 U	16.10	1.12	0.218	2.5 U	17.60	46.80
98B19-2.5'	11-Mar-98	mg/Kg	5.77	151.0	U	2.33	13.90	6.49	14.30	15,600	14.20	518	0.075 U	16.70	1.53	0.336	2.5 U	20.00	49.00
98B19-5.0'	11-Mar-98	mg/Kg	6.54	139.0	U	2.24	13.20	7.88	14.80	17,680	11.90	597	0.075 U	16.50	1.01	0.370	2.5 U	19.50	47.30
98B19-7.5'	11-Mar-98	mg/Kg	7.68	158.0	U	2.40	12.30	7.96	13.00	17,200	14.10	630	0.075 U	16.70	1.22	0.258	2.5 U	19.00	45.30
98B19-10.0'	11-Mar-98	mg/Kg	10.30	183.0	U	2.35	10.60	7.04	13.30	16,700	12.30	746	0.075 U	19.30	1.24	0.210	2.5 U	16.10	49.10
98B19-12.5'	11-Mar-98	mg/Kg	6.68	188.0	U	2.42	13.20	6.26	11.00	18,900	12.00	465	0.075 U	14.10	1.01	0.372	2.5 U	20.60	56.00
98B19-15.0'	11-Mar-98	mg/Kg	7.91	210.0	U	3.99	10.80	11.40	15.40	21,000	13.30	1,570	0.075 U	38.10	1.25	0.446	2.5 U	21.50	56.60
98B19-16.8'	11-Mar-98	mg/Kg	5.0 U	134.0	U	2.19	13.70	6.70	12.40	14,700	14.60	491	0.075 U	19.40	1.34	0.271	2.5 U	19.70	48.70
DUPLICATE	11-Mar-98	mg/Kg	5.0 U	145.0	U	2.08	16.50	6.11	11.30	14,400	15.10	452	0.075 U	17.90	1.86	0.277	2.5 U	23.80	43.40

7.0-R STRIKETHROUGH INDICATES REJECTED (R) DATA BASED ON ANALYSIS OUTSIDE OF HOLDING TIME

J = VALUES ARE ESTIMATED

U = UNDETECTED

B18 Shaded borings located inside OAS building.

mg/kg = Milligrams per kilogram

TABLE 3-5
SUMMARY OF TOTAL METALS IN SURFACE WATER - OXBOW
QAS Site
Blue Summit, MO

SAMPLE NUMBER	DATE OF COLLECTION	ARSENIC mg/l	BARIUM mg/l	CADMIUM mg/l	CHROMIUM mg/l	LEAD mg/l	MANGANESE mg/l	MERCURY mg/l	NICKEL mg/l	SELENIUM mg/l	SILVER mg/l
OX-1	9/8/2004 17:30	0.01 U	0.16	0.005 U	0.01 U	0.0077	1.7	0.0002 U	0.01 U	0.011	0.005 U
OX-2	9/8/2004 17:10	0.01 U	0.11	0.005 U	0.01 U	0.005 U	0.34	0.0002 U	0.01 U	0.01 U	0.005 U
OX-3	9/8/2004 16:15	0.01 U	0.12	0.005 U	0.01 U	0.005 U	0.44	0.0002 U	0.01 U	0.01 U	0.005 U
OX-4	9/8/2004 15:40	0.01 U	0.11	0.005 U	0.01 U	0.005 U	0.48	0.0002 U	0.01 U	0.017	0.005 U
OX-5	9/8/2004 14:40	0.01 U	0.18	0.005 U	0.01 U	0.02	1	0.0002 U	0.01 U	0.012	0.005 U
OX-6	9/8/2004 12:30	0.01 U	0.13	0.005 U	0.01 U	0.0053	1.5 J6	0.0002 U	0.01 U	0.01 U	0.005 U
OX-7	9/8/2004 16:30	0.01 U	0.12	0.005 U	0.01 U	0.005 U	0.42	0.0002 U	0.01 U	0.01 U	0.005 U
OX-8	9/8/2004 16:45	0.01 U	0.11	0.005 U	0.01 U	0.005 U	0.36	0.0002 U	0.01 U	0.01 U	0.005 U
OX-9	9/8/2004 15:55	0.01 U	0.12	0.005 U	0.01 U	0.005 U	0.63	0.0002 U	0.01 U	0.01 U	0.005 U
OX-10	9/8/2004 14:55	0.01 U	0.23	0.005 U	0.012	0.039	1.8	0.0002 U	0.01 U	0.01 U	0.005 U
Frequency of Detection (%)		0.00	100	0.00	10	40	100	0.00	0.00	30	0.00
Maximum Detected Conc.		ND	0.23	ND	0.012	0.039	1.8	ND	ND	0.017	ND
Average Concentration			0.14			0.010	0.87			0.011	
BRD-1	9/8/2004 18:00	0.01 U	0.13	0.005 U	0.01 U	0.005 U	0.31	0.0002 U	0.01 U	0.01 U	0.005 U
BRU-1	9/8/2004 17:45	0.01 U	0.12	0.005 U	0.01 U	0.005 U	0.13	0.0002 U	0.01 U	0.01 U	0.005 U

Defintions:

mg/l = milligrams per liter

BRD = Blue River Downstream Location

BRU = Blue River Upstream Location

U = Not detected at or above detection limit

J6 = Matrix interference; spike value is low.

ND = Not Detected

Table 3-6
Summary of Metal Results for Oxbow Sediment Samples
Quality Analytical Services Site
Blue Summit, MO

SAMPLE NUMBER	DATE OF COLLECTION	ARSENIC mg/kg	BARIUM mg/kg	CADMIUM mg/kg	CHROMIUM mg/kg	LEAD mg/kg	MANGANESE mg/kg	MERCURY mg/kg	NICKEL mg/kg	SELENIUM mg/kg	SILVER mg/kg
OX-1	9/8/2004 17:30	4.2	110	0.3	12	40	310	0.038	21	6.2	0.25 U
OX-2	9/8/2004 17:10	3.1	120	0.25 U	10	17	250	0.023	19	5.1	0.25 U
OX-3	9/8/2004 16:15	5.5	120	0.25 U	15	39	340	0.034	27	7.4	0.25 U
OX-4	9/8/2004 15:55	4.4	120	0.37	14	43	240	0.11	24	6.2	0.25 U
OX-5	9/8/2004 14:40	3.6	110	0.31	11	30	200	0.04	20	5.5	0.25 U
OX-6	9/8/2004 12:30	4.3	120	0.44	14 J3	44 J5	270	0.05	24 J3	6.6 J3J6	0.25 U
OX-7	9/8/2004 16:30	5.4	120	0.28	13	36	280	0.036	24	7.1	0.25 U
OX-8	9/8/2004 16:45	5.3	120	0.3	13	34	270	0.039	22	5.5	0.25 U
OX-9	9/8/2004 15:55	4.4	130	0.33	12	51	240	0.035	20	5.6	0.25 U
OX-10	9/8/2004 14:55	3.6	99	0.32	12	37	230	0.035	18	5.3	0.25 U
Maximum Detected Conc.		5.5	130	0.44	15	51	340	0.11	27	7.4	ND
Average Concentration		4.38	116.9	0.29	12.6	37.1	263	0.044	21.9	6.05	

Notes:

mg/kg = milligrams per kilogram

U = Not detected at or above detection limit

J3 = Quality control outside the established QC range for precision.

J5 = Matrix interference; spike value is high.

J6 = Matrix interference; spike value is low.

**TABLE 4-1
EXPOSURE PATHWAY ANALYSIS
QUALITY ANALYTICAL SERVICES Site
Blue Summit, Missouri**

Scenario Timeframe	Source Medium	Exposure Medium	Exposure Point	Receptor Population	Receptor Age	Exposure Route	Exposure Areas	Type of Analysis	Corresponding Exposure Rationale and Analysis
Current/ Future	Soil	Surface Soil (0-1)	Surface Soil (0-1)	Commercial - Indoor Worker		Ingestion	On-Site and Off-Site Area 1	Quantitative	Soil COPCs were selected by comparison to Region 9 (R9) PRGs and background levels (metals). Potential adverse health risks associated with exposures to soils COPCs were quantified.
		Subsurface (0-2)	Subsurface (0-2)	Commercial - Outdoor Worker	Adult	Ingestion Dermal Absorption	On-Site and Off-Site Area 1	Quantitative Quantitative	
		Subsurface Soil	Subsurface Soil	Construction Worker		Inhalation		Quantitative	
Current/ Future	Groundwater	Indoor Air	Buildings	Commercial - Indoor Worker	Adult	Inhalation	On-Site and Off-Site Area 1	Quantitative	The MDCs in groundwater were compared to Look-up Screening Tables in EPA's Vapor Intrusion to Indoor Air Pathway Guidance (USEPA, 2002). COPCs selected for the indoor air pathway were further evaluated using the J&E Model.
Current/ Future	Groundwater	Indoor Air	Buildings	Downgradient Off-site Resident	Adult/ Child	Inhalation	Off-Site Area 2	Quantitative	The MDCs in groundwater were compared to Look-up Screening Tables in EPA's Vapor Intrusion to Indoor Air Pathway Guidance (USEPA, 2002). COPCs selected for the indoor air pathway were further evaluated using the J&E Model.
Future	Groundwater	Off-site Area 2 Groundwater	Private Well	Off-Site Area 2 Resident	Adult/ Child	Ingestion Dermal Absorption Inhalation	Off-Site Area 2	Qualitative	Currently, impacted groundwater is not used as a potable source, nor is it expected to be used in the future based on site conditions and surrounding land use. Based on site and regional groundwater flow, site groundwater flows west toward the oxbow and Blue River. However, west of the Blue River, groundwater flow is east towards the low lying Blue River; thus site groundwater is not expected to reach residential areas.
Future	Groundwater	Groundwater	Well	Commercial Worker	Adult	Ingestion Dermal Absorption Inhalation	Off-Site Areas 1 and 2	Quantitative Quantitative Quantitative	Currently, impacted groundwater is not used for potable or industrial purposes, nor is it expected to be used in the future based on site conditions and surrounding land use.
Current/ Future	Groundwater	Surface Water	Oxbow	Recreational User	Adult/ Child	Ingestion Dermal Absorption Inhalation	Off-Site Area 2	Quantitative Qualitative Insignificant	No VOCs were detected in surface water or sediment samples from the oxbow. Thus, the inhalation pathway is not expected to be significant. Recreational user scenario assessed using modeled groundwater-to-surface water estimates.

U.S. EPA, 2002, Draft Guidance for Evaluating the Vapor Intrusion to Indoor Air Pathway from Groundwater and Soils, November.

J&E Model = Johnson and Ettinger Model

TABLE 4-2
SUMMARY OF BACKGROUND EVALUATION OF DETECTED METALS IN ALL SOILS
QUALITY ANALYTICAL SERVICES SITE
BLUE SUMMIT, MO

SAMPLE ID	SAMPLE DATE	UNITS	ARSENIC	BARIUM	BERYLLIUM	CADMIUM	CHROMIUM	COBALT	COPPER	IRON	LEAD	MANGANESE	MERCURY	NICKEL	SILVER	THALLIUM	VANADIUM	ZINC
97B1-4"	13-Oct-97	mg/Kg	5.0 U	74.8	0.199	0.929	5.82	1.5 J	8.87 J	4,420	8.37	228	0.075 U	7.1	2.9	0.185 U	10.30	17.70 J
97B2-4"	13-Oct-97	mg/Kg	5.0 U	94.5	0.443	1.66	10.3	3.24 J	9.53 J	8,620	15	415	0.075 U	12.6	2.450	0.185 U	16.90	36.70 J
97B2-2.5'	13-Oct-97	mg/Kg	6.98	175.0	0.903	2.993	13.4	7.70 J	14 J	18,600	16	799	0.09	20.2	0.326	0.215	17.10	52.00 J
97B2-7.5'	13-Oct-97	mg/Kg	5.0 U	98.1	0.615	2.19	12.8	5.63 J	12 J	14,100	12	351	0.075 U	15.1	0.310	0.185 U	18.10	56.60 J
97B2-10.0'	13-Oct-97	mg/Kg	15.4	107.0	1.12	4.59	23.4	12.1 J	20 J	20,400	20	439	0.075 U	46.1	0.287	0.395	12.40	195.00 J
97B3-3"	14-Oct-97	mg/Kg	5.0 U	45.5	0.223 J	0.775	5.57	1.82 J	6.92	5,100	20	335 J	ND-(076) UR	6.96	2.5 U	0.185 U	10.40	29.70 J
97B3-2.5'	14-Oct-97	mg/Kg	6.04	122	0.878 J	2.15	12.7	7.29 J	12	14,200	14	553 J	ND-(076) UR	16.5	2.5 U	0.185 U	22.60	40.90 J
97B3-5.0'	14-Oct-97	mg/Kg	6.07	118	0.838 J	1.78	10.5	7.27 J	11	14,100	15	597 J	0.4070 R	16.0	2.5 U	0.185 U	18.30	39.60 J
97B3-7.0'	14-Oct-97	mg/Kg	5.0 U	139	0.695 J	1.85	10.7	6.83 J	12	13,800	16	634 J	0.4020 R	14.8	2.5 U	0.185 U	16.80	41.30 J
97B3-10.0'	14-Oct-97	mg/Kg	7.91	174	0.745 J	2.05	11.8	7.36 J	12	17,100	14	605 J	0.4440 R	14.5	2.5 U	0.185 U	20.20	47.40 J
97B3-12.0'	14-Oct-97	mg/Kg	7.13	118	0.693 J	1.96	9.91	6.71 J	12	14,600	14	499 J	ND-(076) UR	16.7	2.5 U	0.185 U	17.10	45.30 J
97B3-15.0'	14-Oct-97	mg/Kg	7.43	144	0.7092 J	1.98	9.78	7.28 J	13	15,600	15	507 J	0.0760 R	17.8	2.5 U	0.211	18.90	51.10 J
DUPLICATE	14-Oct-97	mg/Kg	5.1	150	0.699 J	1.83	10.8	7.49 J	12	13,100	14	641 J	0.087	14.1	2.5 U	0.185 U	20.10	43.70 J
97B4-3"	20-Oct-97	mg/Kg	5.0 U	41.7	0.195	1.09	6.39	1.71 J	10	5,120	43	251 J	0.075 U	6.62 J	2.5 U	0.185 U	4.28	86.40 J
97B5-8"	20-Oct-97	mg/Kg	5.0 U	146	0.395	1.32	8.88	4.76 J	12	7,820	43	515 J	0.075 U	13.60 J	2.5 U	0.185 U	9.64	64.60 J
97B6-4"	20-Oct-97	mg/Kg	5.0 U	49.8	0.285	0.801	7.26	2.44 J	7.19	5,610	12	257 J	0.075 U	8.46 J	2.5 U	0.185 U	8.32	27.80 J
97B8-10.0'	20-Oct-97	mg/Kg	16.2	91.4	0.988	5.23	68.3	8.98 J	58	16,800	68	208 J	0.178	54.80 J	2.5 U	0.982	389.0	5.34 J
97B7-4"	21-Oct-97	mg/Kg	5.0 U	60.5	0.315	1.37	7.29	2.85	7.16 J	6,390	26	363 J	0.075 U	9.58	2.5 U	0.185 U	9.54	31.80 J
97B7-10.0'	21-Oct-97	mg/Kg	5.51	164	0.691	2.30	10.7	6.9	12 J	13,900	15	681 J	0.075 U	15.5	2.5 U	0.185 U	18.30	47.80 J
97B8-6"	21-Oct-97	mg/Kg	5.0 U	110	0.25	1.24	7.0	2.0	8.94 J	5,270	15	321 J	0.075 U	8.09	2.5 U	0.185 U	7.19	39.70 J
97B8-5"	21-Oct-97	mg/Kg	5.0 U	132	0.887	2.77	16.8	8.48	14 J	16,600	19	699 J	0.075 U	20.4	2.5 U	0.219	20.10	47.60 J
97B8-10"	21-Oct-97	mg/Kg	5.0 U	166	0.802	2.64	13.5	8.31	13 J	15,000	17	707 J	0.075 U	20.5	2.5 U	0.185 U	19.40	49.10 J
97B8-15'	21-Oct-97	mg/Kg	5.56	141	0.913	2.78	15.5	8.33	15 J	16,500	18	803 J	0.075 U	21.2	2.5 U	0.234	22.30	61.40 J
97B9-2"	3-Nov-97	mg/Kg	5.0 U	63.4	0 U	1.53 J	6.85	3.41	7.89	7,120	13	408	0.075 U	9.2 J	2.5 U	0.185 U	7.48	33.50 J
97B9-5"	3-Nov-97	mg/Kg	5.72	186	0.963	2.92 J	18.1	8.38	13	15,600	18	657	0.075 U	21.4 J	2.5 U	0.185 U	23.70	46.10 J
97B9-10.0'	3-Nov-97	mg/Kg	5.25	143	0.843	2.55 J	13.2	8.33	13	14,900	17	715	0.075 U	20.7 J	2.5 U	0.185 U	19.00	54.90 J
97B9-15.0'	3-Nov-97	mg/Kg	6.48	174	0.832	2.84 J	13.8	8.56	13	16,600	15	578	0.075 U	20.2 J	2.5 U	0.185 U	19.30	51.90 J
97B10-6"	4-Nov-97	mg/Kg	5.0 U	79.2	0.383	1.46	8.55	3.19 J	10	7,920	25	349	0.075 U	10.7	2.5 U	0.185 U	13.20 J	53.90
97B10-5.0'	4-Nov-97	mg/Kg	6.33	150	0.952	3.04	15.7	8.85 J	14	17,900	19	784	0.075 U	23.2	2.5 U	0.185 U	19.90 J	51.00
97B10-10.0'	4-Nov-97	mg/Kg	7.62	608	0.425	2.92	15.5	10.2 J	15	17,500	21	706	0.075 U	23.3	2.5 U	0.185 U	20.10 J	66.60
97B10-15.0'	4-Nov-97	mg/Kg	6.58	150	0.848	2.93	16.3	9.29 J	15	17,200	16	708	0.075 U	23.1	2.5 U	0.185 U	19.50 J	47.70
97B11-6"	5-Nov-97	mg/Kg	5.0 U	47.4	0.116	1.06	5.51	2.51 J	12	4,060	19	232	0.075 U	8.27	2.5 U	0.185 U	8.75	55.20
97B11-10.0'	5-Nov-97	mg/Kg	6.4	122	0.90	2.53	14.2	7.52 J	12	16,300	17	621	0.075 U	19.2	2.5 U	0.20	19.30	43.70
97B11-15.0'	6-Nov-97	mg/Kg	5.0 U	115	0.798	2.48	12.4	7.08 J	12	13,100	15	647	0.075 U	19.7	2.5 U	0.185 U	18.60	49.60
97B12-6"	10-Nov-97	mg/Kg	5.0 U	62.9	0.177	1.41	7.64	2.5 J	13	6,580	19	411	0.075 U	7.05	2.5 U	0.185 U	10.10	52.40 J
97B12-10.0'	10-Nov-97	mg/Kg	5.0 U	137	0.523	2.86	13.1	5.1 J	26	10,400	166	415	0.091	15.5	2.5 U	0.185 U	18.60	25.30 J
97B12-15.0'	10-Nov-97	mg/Kg	5.76	144	0.795	2.88	14.4	9.30 J	13	14,600	17	763	0.075 U	19.4	2.5 U	0.185 U	18.00	51.80 J
97B12-DUP	10-Nov-97	mg/Kg	5.23	158	0.687	2.77	12.2	8.44 J	12	13,200	16	712	0.075 U	18.9	2.5 U	0.185 U	17.00	63.30 J
97B13-6"	11-Nov-97	mg/Kg	5.0 U	42	0.0532	0.822	4.37	1.33 J	6.87	3,620	9.78	301	0.075 U	5.37	4.19	0.185 U	8.29	46.60 J
97B13-10.0'	11-Nov-97	mg/Kg	6.02	148	0.782	2.85	12.2	9.1 J	11	14,900	17	750	0.075 U	20.9	2.5 U	0.185 U	15.60	56.00 J
97B13-15.0'	11-Nov-97	mg/Kg	5.0 U	131	0.707	2.8	11.9	8.19 J	12	14,400	15	679	0.075 U	18.1	2.5 U	0.185 U	16.00	60.80 J
97B13-DUP	11-Nov-97	mg/Kg	5.30	107	0.699	2.72	12.00	8.55 J	12.70	13,800	14.40	904	0.075 U	19.50	2.5 U	0.185 U	17.50	47.00 J

TABLE 4-2
SUMMARY OF BACKGROUND EVALUATION OF DETECTED METALS IN ALL SOILS
QUALITY ANALYTICAL SERVICES SITE
BLUE SUMMIT, MO

SAMPLE ID	SAMPLE DATE	UNITS	ARSENIC	BARIUM	BERYLLIUM	CADMIUM	CHROMIUM	COBALT	COPPER	IRON	LEAD	MANGANESE	MERCURY	NICKEL	SILVER	THALLIUM	VANADIUM	ZINC
97B14-6"	24-Nov-97	mg/Kg	5.95	168	0.693	2.80	10.30	7.03	11.60	14,300	15.80	618	0.075 U	14.60	2.5 U	0.185 U	20.00	57.90
97B14-5.0'	24-Nov-97	mg/Kg	6.76	155	0.669	2.84	11.0	7.36	13.1	14,800	15.4	537	0.075 U	16.2	2.5 U	0.185 U	19.20	76.10
97B14-10.0'	24-Nov-97	mg/Kg	5.0 U	127	0.567	2.42	11.2	7.61	12.5	12,600	16.6	339	0.075 U	15.8	2.5 U	0.24	18.50	50.80
97B14-15.0'	24-Nov-97	mg/Kg	5.0 U	98.3	0.4681	1.74	9.44	5.07	11.5	9,210	12.5	125	0.075 U	11.9	2.5 U	0.185 U	15.10	47.20
97B15-6"	25-Nov-97	mg/Kg	9.08	132	0.865	2.91	12.9	6.70	16.9	15,600	18.6	418	0.0840 R	14.7	2.5 U	0.205	20.90	48.50
97B15-5.0'	25-Nov-97	mg/Kg	8.43	170	0.739	2.85	10.4	7.25	14.5	14,600	14.7	715	0.1240 R	18.4	2.5 U	0.185	20.70	65.40
97B15-10.0'	25-Nov-97	mg/Kg	7.58	133	0.652	2.34	11.0	6.69	12.9	14,300	13.9	325	ND(0.075) UR	15.6	2.5 U	0.185 U	22.70	45.50
97B15-15.0'	25-Nov-97	mg/Kg	8.05	185	0.556	2.30	7.43	6.14	11.8	10,500	13.5	1,265	0.1190 R	15.4	2.5 U	0.185 U	17.80	46.00
97B15-DUP	25-Nov-97	mg/Kg	7.09	143	0.627	2.06	17.3	5.62	11.2	11,900	13.3	472	0.0910	14.1	2.5 U	0.185 U	17.40	51.10
97B16-6"	26-Nov-97	mg/Kg	7.01	361	0.834	2.59	12.7	6.66	16.5	14,800	16.5	566	0.0428 R	18.0	2.5 U	0.34	21.00	55.50
97B16-5.0'	26-Nov-97	mg/Kg	7.55	204	0.663	2.26	13.8	6.50	12.1	12,300	14.2	799	0.0770 R	16.9	2.5 U	0.20	19.40	48.30
97B16-10.0'	26-Nov-97	mg/Kg	6.05	149	0.60	2.21	10.6	5.66	11.7	11,500	13.5	318	ND(0.075) UR	13.8	2.5 U	0.27	15.60	54.10
97B16-15.0'	26-Nov-97	mg/Kg	18	130	0.7286	3.64	10.7	5.12	12.2	21,500	14.2	609	0.1330 R	15.5	2.5 U	0.255	25.20	70.40
98B17-0.0'	10-Mar-98	mg/Kg	6.37	172	0.05 U	2.46	13.5	6.28	12.2	14,800	11.6	488	0.0780	14.9	1.86	0.246	18.60	40.50
98B17-2.5'	10-Mar-98	mg/Kg	8.37	197	0.05 U	2.46	11.7	7.26	13.8	16,100	13.5	667	0.075 U	16.6	1.03	0.226	16.50	47.40
98B17-5.0'	10-Mar-98	mg/Kg	7.32	153	0.05 U	2.28	12.2	7.56	13.4	15,800	13.8	536	0.075 U	16.3	1.07	0.297	17.20	46.50
98B18-0.0'	11-Mar-98	mg/Kg	5.0 U	154	0.05 U	1.72	10.9	4.29	9.78	11,200	6.91	417	0.075 U	10.4	2.05	0.222	15.10	34.10
98B18-2.5'	11-Mar-98	mg/Kg	6.94	198	0.05 U	2.67	11.5	7.48	13.3	15,600	13.1	612	0.075 U	17.7	1.01	0.28	15.00	50.90
98B18-5.0'	11-Mar-98	mg/Kg	6.66	186	0.05 U	2.12	11.1	5.61	12.0	15,400	12.0	405	0.075 U	13.2	1.01	0.333	13.70	47.60
98B18-7.5'	11-Mar-98	mg/Kg	9.01	120	0.05 U	4.20	20.2	7.72	22.0	15,100	21.1	1,420	0.075 U	40.9	1.06	0.283	41.80	118.00
98B19-0.0'	11-Mar-98	mg/Kg	5.11	165	0.05 U	2.26	13.4	5.27	12.2	15,300	15.3	380	0.075 U	16.1	1.12	0.218	17.60	46.80
98B19-2.5'	11-Mar-98	mg/Kg	5.77	151	0.05 U	2.33	13.9	6.49	14.3	15,600	14.2	518	0.075 U	16.7	1.53	0.336	20.00	49.00
98B19-5.0'	11-Mar-98	mg/Kg	6.54	139	0.05 U	2.24	13.2	7.88	14.8	17,680	11.9	597	0.075 U	16.5	1.01	0.370	19.50	47.30
98B19-7.5'	11-Mar-98	mg/Kg	7.68	158	0.05 U	2.40	12.3	7.96	13.0	17,200	14.1	630	0.075 U	16.7	1.22	0.258	19.00	45.30
98B19-10.0'	11-Mar-98	mg/Kg	10.3	183	0.05 U	2.35	10.6	7.04	13.3	16,700	12.3	746	0.075 U	19.3	1.24	0.210	16.10	49.10
98B19-12.5'	11-Mar-98	mg/Kg	6.68	188	0.05 U	2.42	13.2	6.26	11.0	18,900	12.0	465	0.075 U	14.1	1.01	0.372	20.60	56.00
98B19-15.0'	11-Mar-98	mg/Kg	7.91	210	0.05 U	3.99	10.8	11.40	15.4	21,000	13.3	1,570	0.075 U	38.1	1.25	0.446	21.50	56.60
DUPLICATE	11-Mar-98	mg/Kg	5.0 U	145	0.05 U	2.08	16.5	6.11	11.3	14,400	15.1	452	0.075 U	17.9	1.86	0.277	23.80	43.40
Number of Detects/Samples			46 70	70 70	54 70	70 70	70 70	70 70	70 70	70 70	70 70	70 70	6 70	70 70	21 70	29 70	70 70	70 70
MAX Detected Concentration			18	608	1.12	5.23	68.3	12.1	58.1	21,500	166	1,570	0.178	54.8	4.19	2.61	389	195
Geometric Mean			5.0	131	0.32	2.20	11.5	5.91	12.49	12,532	16	518	0.042	16	1.22	2.5	17	48
Published Background Levels **			8.7	580	0.80	1.0 U	54.0	10.0	13.0	26,000 +++	20	740	0.039	14.0	NA	NA	69	49
Is Mean > Background?			No	No	No	Yes	No	No	No	No	No	No	Yes	Yes	NA	NA	No	No

7.0-R STRIKETHROUGH INDICATES REJECTED (R) DATA BASED ON ANALYSIS OUTSIDE OF HOLDING TIME

J = VALUES ARE ESTIMATED

U = UNDETECTED

NA = Not Available

MDC = Maximum detected concentration

* = Average/Mean concentrations were calculated using one-half the detection limit (DL) of non-detected values, except for beryllium where DLs were not available thus only detected concentrations were averaged.

** = Tidball, Ronald, R., 1984, Geochemical Survey of Missouri: Geography of Soil Geochemistry and Classification by Factor Analysis of Missouri Agricultural Soils (USGS Professional Paper 954-H, I.)

+++ = Shacklette, Hansford T. and Boemgen, Josephine., 1984. Averages are provided.

Scenario Timeframe: Current/Future
Medium: Soil
Exposure Medium: Soil (0-15 feet)
Exposure Point: Soil (0-15 feet)

TABLE 4-3
OCCURRENCE, DISTRIBUTION AND SELECTION OF CHEMICALS OF POTENTIAL CONCERN
Quality Analytical Services Site
Blue Summit, Missouri

CAS Number	Chemical Detected in Soils	Minimum Concentration	Maximum Detected Concentration (MDC)	Units	Location of Maximum Concentration	Range of Detection Limits	Concentration Used for Screening (MDC)	Screening Toxicity Value (1)		COPC Flag	Rationale (2) for Chemical Deletion or Selection
								Industrial	(Res)		
67-64-1	Acetone	0.5 U	1070	mg/kg	97B16-5'	0.5	1070	54,000 nc	14000 nc	No	BSL
120-12-7	Anthracene	0.4 U	0.062 J	mg/kg	B19R-15'	0.4-0.42	0.062	100000 max	22000 nc	No	BSL
319-85-7	beta-BHC	0.002 U	0.00881	mg/kg	97B16-6"	0.002	0.00881	1.3 ca	0.32 ca	No	BSL
117-81-7	Bis(2-ethylhexyl)phthalate	0.4 U	0.21 J	mg/kg	B19R-15'	0.4-0.42	0.21	120 ca	35 ca*	No	BSL
7440-43-9	Cadmium	0.775	5.23	mg/kg	97B6-10.0'	--	5.23	450 nc	37 nc	No	BSL
74-87-3	Chloromethane	0.5 U	66.9 J	mg/kg	97B6-10.0'	0.5	66.9	160 nc	47 nc	No	BSL
84-74-2	Di-n-butyl phthalate	0.4 U	0.14 B,J	mg/kg	B19R-15'	0.4	0.14	62,000 nc	6100 nc	No	BSL
76-44-8	Heptachlor	0.0012 U	0.0549	mg/kg	97B4-3"	0.0012-0.002	0.0549	0.38 ca	0.11 ca*	No	BSL
7439-97-6	Mercury	0.075 U	0.178	mg/kg	97B6-10.0'	0.075	0.178	310 nc	23 nc	No	BSL
75-09-2	Methylene chloride	0.05 U	111	mg/kg	97B15-10'	0.05	111	21 ca	9.1 ca	Yes	ASL
7440-02-0	Nickel	5.4	54.8 J	mg/kg	97B6-10.0'	--	54.8	20,000 ca	1600 nc	No	BSL
1336-36-3	PCB - 1260	0.002 U	0.0987	mg/kg	97B5-6"	0.002	0.0987	0.74 ca*	0.22 ca	No	BSL
7440-22-4	Silver	0.29	4.2	mg/kg	97B13-6"	--	4.2	5,100 nc	390 nc	No	BSL
79-34-5	1,1,2,2-Tetrachloroethane	0.0125 U	15.3	mg/kg	97B1-4"	0.0125	15.3	0.93 ca	0.41 ca	Yes	ASL
7791-12-0	Thallium	0.185 U	0.982	mg/kg	97B6-10.0'	0.185	0.982	67 nc	5.2 nc	No	BSL
108-88-3	Toluene	0.0625 U	96	mg/kg	97B13-6"	0.0625	96	520 sat	520 sat	No	BSL
1330-20-7	Xylene, total	0.0625 U	0.24	mg/kg	97B18-7.5'	0.0625	0.24	420 sat	270 nc	No	BSL

Notes:

- (1) EPA Region 9 Preliminary Remediation Goal (PRG) is used (October, 2004).
Soil PRGs include ingestion, inhalation, and dermal contact exposure pathways.
c = carcinogenic risk, risk = 1×10^{-6} nc = non-carcinogenic risk, HI = 1
- (2) Rationale Codes Selection Reason: Above Screening Levels (ASL)
Deletion Reason: Below Screening Level (BSL)

Definitions: COPC = Chemical of Potential Concern
MDC = Maximum Detected Concentration
U = UNDETECTED
B = Detected in Blank
J = VALUES ARE ESTIMATED
sat = soil saturation concentration

Scenario Timeframe:	Current/Future
Medium:	Groundwater
Exposure Medium:	Groundwater

TABLE 4-4a
COMPARISON OF BACKGROUND LEVELS IN GROUNDWATER
Quality Analytical Services Site
Blue Summit, Missouri

CAS Number	Analyte Detected in Groundwater	Minimum Concentration	Maximum Detected Concentration (MDC)	Units	Location-Date of Maximum Concentration	Range of Detection Limits	Concentration Used for Screening (MDC)	Missouri Background Levels (1)		Rationale for (2) Contaminant Deletion or Selection
								range	mean	
7440-38-2	Arsenic	0.01 U	0.088	mg/L	GW-12B (9/04)	0.01-0.09	0.088	NA		BNA
7440-39-3	Barium	0.072	4.6	mg/L	GW-12A (5/05)	--	4.6	24-650	200	BBL
7440-43-9	Cadmium	0.005 U	0.048	mg/L	GW-12A (5/05)	0.005	0.048	< 0.001-0.003	<0.0014	ABL
18540-29-9	Chromium, total	0.01 U	0.7	mg/L	GW-12A (5/05)	0.01	0.7	NA		BNA
7439-92-1	Lead	0.005 U	0.56	mg/L	GW-12A (5/05)	0.005	0.56	< 0.0057		ABL
7439-96-5	Manganese	0.093	25	mg/L	GW-12A (5/05)	--	25	0.06-2.9	0.47	ABL
7487-94-7	Mercury	0.0002 U	0.00094	mg/L	GW-12A (5/05)	0.0002	0.00094	NA		BNA
7440-02-0	Nickel	0.01 U	0.57	mg/L	GW-12A (5/05)	0.01-0.02	0.57	NA		BNA
7782-49-2	Selenium	0.01 U	0.042	mg/L	GW-10B (5/05)	0.01-0.02	0.042	NA		BNA
7440-22-4	Silver	0.005 U	0.014 J	mg/L	GW-12C (12/03)	0.005	0.014 J	NA		BNA

(1) Gerald L. Feder, 1979. "Geochemical Survey of Missouri – Geochemical Survey of Waters of Missouri". USGS Professional Paper 954-E. Table 4, Glacial deposits.

(2) Rationale Codes	Selection Reason:	Above Background Levels (ABL)
		Background Level Not Available (BNA)
	Deletion Reason:	Below Background Level (BBL)

Definitions: mg/L = milligrams per liter
 < or U = undetected as detection limit
 J = estimated concentration

Scenario Timeframe:	Current/Future
Medium:	Groundwater
Exposure Medium:	Groundwater

TABLE 4-4b
OCCURRENCE, DISTRIBUTION AND SELECTION OF CHEMICALS OF POTENTIAL CONCERN
Quality Analytical Services Site
Blue Summit, Missouri

CAS Number	Chemical Detected in Groundwater	Minimum Concentration	Maximum Detected Concentration (MDC)	Units	Location-Date of Maximum Concentration	Range of Detection Limits	Concentration Used for Screening (MDC)	Screening ⁽¹⁾ Toxicity Values Tap Water	COPC Flag	Rationale for ⁽²⁾ Contaminant Deletion or Selection
7440-38-2	Arsenic	0.01 U	0.088	mg/L	GW-12B (9/04)	0.01-0.09	0.088	0.000045 ca	Yes	ASL
71-43-2	Benzene	0.001 U	0.0016	mg/L	GW-11C (11/05)	0.001-0.005	0.0016	0.00035 ca	Yes	ASL
104-51-8	n-Butyl benzene	0.001 U	0.005	mg/L	GW-11C (7/03)	0.001	0.005	0.24 nc	No	BSL
135-9-88	sec-Butyl benzene	0.001 U	0.0031	mg/L	GW-11C (7/03)	0.001-0.005	0.0031	0.24 nc	No	BSL
7440-43-9	Cadmium	0.005 U	0.048	mg/L	GW-12A (5/05)	0.005	0.048	0.018 nc	Yes	ASL
75-00-3	Chloroethane	0.001 U	0.0017	mg/L	GW-11C (5/05)	0.001	0.0017	0.0046 ca	No	BSL
18540-29-9	Chromium, total	0.01 U	0.7	mg/L	GW-12A (5/05)	0.01	0.7	55 nc	No	BSL
75-34-3	1,1-Dichloroethane	0.001 U	0.069 E	mg/L	GW-11C (11/05)	0.001	0.069 E	0.81 nc	No	BSL
75-35-4	1,1-Dichloroethylene	0.001 U	0.0043	mg/L	GW-11C (11/05)	0.001	0.0043	0.34 nc	No	BSL
156-59-2	cis-1,2-Dichloroethylene	0.001 U	0.19	mg/L	GW-11C (9/04)	0.001	0.19	0.061 nc	Yes	ASL
123-91-1	1,4-Dioxane	0.001 U	2.80	mg/L	GW-11C (7/03)	0.001-0.01	2.8	0.0061 ca	Yes	ASL
98-82-8	Isopropyl benzene	0.001 U	0.002	mg/L	GW-11C (7/03)	0.001-0.005	0.002	0.66 nc	No	BSL
25155-15-1	p-Isopropyl toluene	0.001 U	0.0011	mg/L	GW-11C (7/03)	0.001-0.005	0.0011	0.66 *	No	NSL
7439-92-1	Lead	0.005 U	0.56	mg/L	GW-12A (5/05)	0.005	0.56	0.015 AL	Yes	ASL
7439-96-5	Manganese	0.093	25	mg/L	GW-12A (5/05)	--	25	0.88 nc	Yes	ASL
7487-94-7	Mercury	0.0002 U	0.00094	mg/L	GW-12A (5/05)	0.0002	0.00094	0.011 nc	No	BSL
1634-04-4	Methyl tert-butyl ether (MTBE)	0.001 U	0.015	mg/L	GW-6B (7/03)	0.001	0.015	0.011 ca	Yes	ASL
91-20-3	Naphthalene	0.001 U	0.0059	mg/L	GW-6B (7/03)	0.001-0.01	0.0059	0.0062 nc	No	BSL
7440-02-0	Nickel	0.01 U	0.57	mg/L	GW-12A (5/05)	0.01-0.02	0.57	0.73 nc	No	BSL
103-65-1	n-Propyl benzene	0.001 U	0.0022	mg/L	GW-11C (7/03)	0.001-0.005	0.0022	0.24 nc	No	BSL
7782-49-2	Selenium	0.01 U	0.042	mg/L	GW-10B (5/05)	0.01-0.02	0.042	0.18 nc	No	BSL
7440-22-4	Silver	0.005 U	0.014 J	mg/L	GW-12C (12/03)	0.005	0.014 J	0.18 nc	No	BSL
156-60-5	trans-1,2-Dichloroethene	0.001 U	0.0011	mg/L	GW-11C (9/04)	0.001-0.005	0.0011	0.12 nc	No	BSL
79-01-6	Trichloroethylene	0.001 U	0.019	mg/L	GW-6B (9/03)	0.001	0.019	0.000028 ca	Yes	ASL
95-63-6	1,2,4-Trimethylbenzene	0.001 U	0.0082	mg/L	GW-11C (7/03)	0.001-0.005	0.0082	0.012 nc	No	BSL
108-67-8	1,3,5-Trimethylbenzene	0.001 U	0.0043	mg/L	GW-11C (7/03)	0.001-0.005	0.0043	0.012 nc	No	BSL
75-01-4	Vinyl chloride	0.001 U	0.14 E	mg/L	GW-11C (11/05)	0.001	0.14 E	0.00002 ca	Yes	ASL
1330-20-7	Xylene (total)	0.003 U	0.0069	mg/L	GW-11C (7/03)	0.003	0.0069	0.21 nc	No	BSL

(1) EPA Region 9 Preliminary Remediation Goals (PRGs) Table on-line, last updated 2004. Values are for Tap Water.

nc = noncarcinogen

c= carcinogen

* = Isopropyl benzene PRG used as a surrogate for p-Isopropyl toluene since chemical structures are similar.

AL = EPA Action Level at the Tap for Lead; no PRG available

(2) Rationale Codes

Selection Reason: Above Screening Levels (ASL)

Deletion Reason: Below Screening Level (BSL)

Definitions: mg/L = milligrams per liter

COPC = Chemical of Potential Concern

U = Undetected

E = Exceeds calibration range, estimated

J = estimated concentration

TABLE 4-4c
SELECTION OF CHEMICALS OF POTENTIAL CONCERN FOR VAPOR INTRUSION PATHWAY
COMPARISON OF GROUNDWATER CONCENTRATIONS WITH SCREENING LEVELS FOR VAPOR INTRUSION PATHWAY
Quality Analytical Services Site
Blue Summit, Missouri

Scenario Timeframe:	Current/Future
Medium:	Groundwater
Exposure Medium:	Indoor Air

Chemical of Potential Concern in Groundwater	Units	Maximum Detected Conc. ¹	Groundwater SL Protective of Indoor Air ²			Is MDC > SL _{gw-vi} ?
			Is COPC toxic & VOC? **	Table 2C 10-6	Table 3C $\alpha = 1 \times 10^{-4}$	
Arsenic	mg/l	0.088	No			NE
Benzene	mg/l	0.0016	Yes	0.005	14	No
Cadmium	mg/l	0.048	No			NE
cis-1,2-DCE	mg/l	0.19	Yes	0.21	2.1	No
1,4-Dioxane	mg/l	2.80	Yes	NA	NA	NA
Lead	mg/l	0.56	No			NE
Manganese	mg/l	25	No			NE
MTBE	mg/l	0.015	Yes	120	1.20E+03	No
Trichloroethylene	mg/l	0.019	Yes	0.005	0.005	Yes
Vinyl Chloride	mg/l	0.14	Yes	0.002	0.0025	Yes

Notes:

1. Obtained from Table 4-4b
2. Groundwater Screening Levels for the Vapor Intrusion Pathway (SL_{gw-vi}) from EPA's Draft Subsurface Vapor Intrusion Guidance (EPA, 2002).

**VOC is defined as having a Henry's Law Constant > 10⁻⁵ atm m³/mol and sufficiently toxic is defined as a risk greater than 10⁻⁶ or hazard index greater than 1.

Table 2C - Generic Screening Levels at a target risk of 10⁻⁶.

Table 3C - Site-Specific Screening Level based on attenuation factor of 1x10⁻⁴ and TR = 10⁻⁶.

NE = Not Evaluated, not a concern under this pathway. NA = Screening level not available

Scenario Timeframe: Current/Future
Medium: Surface Water
Exposure Medium: Surface Water of the oxbow

TABLE 4-5a
OCCURRENCE, DISTRIBUTION AND SELECTION OF CHEMICALS OF POTENTIAL CONCERN
Quality Analytical Services Site
Blue Summit, Missouri

CAS Number	Analyte (totals)	Minimum Concentration	Maximum Detected Concentration (MDC)	Units	Location of Maximum Concentration	Range of Detection Limits	Freq. of Detection (FOD)	Concentration Used for Screening (MDC)	Background Values	Is Conc. Comparable to Upgradient?	Screening Toxicity Values			Is Constituent (4) selected as COPC?
											EPA AWQC (2)		MO (3)	
									Blue River BRU-1	Human Health (org) (org+water)	WQS HHF			
7440-38-2	Arsenic	0.01 U	ND	mg/L	--	0.01	0 / 10	ND	0.01 U	Yes			No nondetect	
7440-39-3	Barium	0.11	0.2	mg/L	OX-10	--	10 / 10	0.2	0.1	No	NA 1.0	NA	No BSL	
7440-43-9	Cadmium	0.005 U	ND	mg/L	--	0.005	0 / 10	ND	0.005 U	Yes			No nondetect	
18540-29-9	Chromium, total	0.01 U	0.012	mg/L	OX-10	0.01	1 / 10	0.012	0.01 U	Yes			No BBL	
7439-92-1	Lead	0.005 U	0.039	mg/L	OX-10	0.005	4 / 10	0.039	0.005 U	No	NA NA	NA	Yes SLNA	
7439-96-5	Manganese	0.34	1.8	mg/L	OX-10	--	10 / 10	1.8	0.01 U	No	0.10	NA	Yes ASL	
7487-94-7	Mercury	0.0002 U	ND	mg/L	--	0.0002	0 / 10	ND	0.0002 U	Yes			No nondetect	
7440-02-0	Nickel	0.01 U	ND	mg/L	--	0.01	0 / 10	ND	0.01 U	Yes			No nondetect	
7782-49-2	Selenium	0.01 U	0.017	mg/L	OX-4	0.01	3 / 10	0.017	0.01 U	Yes			No BBL	
7440-22-4	Silver	0.005 U	ND	mg/L	--	0.005	0 / 10	ND	0.005 U	Yes			No nondetect	

(1) EPA National Recommended Water Quality Criteria, Office of Water, U.S. Environmental Protection Agency, 2006.

Freshwater criteria is the Criterion Continuous Concentration (CCC), which is an estimate of the highest concentration of a material in surface water that an aquatic community can be exposed to indefinitely without resulting in an unacceptable effect.

Organism (org) criteria is for consumption of organisms only and are based on a carcinogenicity of 10-6.

Organism plus water criteria is also based on surface water as a source of drinking water. This criteria is only provided if an org. only criteria is not available since the oxbow is not a drinking water source.

(2) Missouri Department of Natural Resources, Division 20 - Clean Water Commission, Chapter 7 - Water Quality (10 CSR 20-7.031).

HHF = Human Health Protection - Fish Consumption

(4) Rationale Codes Selection Reason: Above Screening Levels (ASL)

Screening Level Not Available (SLNA)

Deletion Reason: Below Screening Level (BSL)

Below or Comparable to Background Level (BBL)

Definitions: mg/L = milligrams per liter of total analyte

U = Undetected at detection limit

ND = Not Detected

BRU = Blue River Upstream Location

Scenario Timeframe:	Current/Future
Medium:	Sediment
Exposure Medium:	Sediment of the oxbow

TABLE 4-5b
OCCURRENCE, DISTRIBUTION AND SELECTION OF CHEMICALS OF POTENTIAL CONCERN
Quality Analytical Services Site
Blue Summit, Missouri

CAS Number	Analyte (totals)	Minimum Concentration	Maximum Detected Concentration (MDC)	Units	Location of Maximum Concentration	Range of Detection Limits	Freq. of Detection (FOD)	Concentration Used for Screening (MDC)	Background Value		Screening Value		Is Constituent retained as COPC? (3)	
									MO Background Soil Levels (1)		Region 9 PRGs (2)			
									mean					
7440-38-2	Arsenic	3.1	5.5	mg/kg	OX-3	--	10 / 10	5.5	8.7			No	BBL	
7440-39-3	Barium	99	130	mg/kg	OX-9	--	10 / 10	130	580			No	BBL	
7440-43-9	Cadmium	0.125 U	0.44	mg/kg	OX-6	0.25	8 / 10	0.44	1	U		No	BBL	
18540-29-9	Chromium, total	10	15	mg/kg	OX-3	--	10 / 10	15	54			No	BBL	
7439-92-1	Lead	17	51	mg/kg	OX-9	--	10 / 10	51	20		400	nc	No	BSL
7439-96-5	Manganese	200	340	mg/kg	OX-3	--	10 / 10	340	740			No	BBL	
7487-94-7	Mercury	0.023	0.11	mg/kg	OX-4	--	10 / 10	0.11	0.039		23	nc	No	BSL
7440-02-0	Nickel	18	27	mg/kg	OX-3	--	10 / 10	27	14		1,600	nc	No	BSL
7782-49-2	Selenium	5.1	7.4	mg/kg	OX-3	--	10 / 10	7.4	NA		390	nc	No	BSL
7440-22-4	Silver	0.25 U	ND	mg/kg	ND	0.25	0 / 10	ND	ND			No	nondetect	

- (1) Tidball, Ronald, R., 1984, Geochemical Survey of Missouri: Geography of Soil Geochemistry and Classification by Factor Analysis of Missouri Agricultural Soils (USGS Professional Paper 954-H, I.) Values in **bold** were exceeded by maximum detected concentration and then compared to PRGs.

- (2) EPA Region 9 Preliminary Remediation Goal (PRG) for residential land use (October, 2004). Soil PRGs include ingestion, inhalation, and dermal contact exposure pathways.

c = carcinogenic risk, risk = 1×10^{-6}

nc = non-carcinogenic risk, HI = 1

- | | | |
|---------------------|-------------------|------------------------------|
| (3) Rationale Codes | Selection Reason: | Above Screening Levels (ASL) |
| | Deletion Reason: | Below Screening Level (BSL) |

Definitions: mg/kg = milligrams per kilogram

U = Undetected at detection limit

ND = Not Detected

NA = Not Available

Table 4-6
Summary of Oxbow Surface Water Samples
Quality Analytical Services Site
Blue Summit, MO

SAMPLE NUMBER	DATE OF COLLECTION	ARSENIC mg/l	BARIUM mg/l	CADMIUM mg/l	CHROMIUM mg/l	LEAD mg/l	MANGANESE mg/l	MERCURY mg/l	NICKEL mg/l	SELENIUM mg/l	SILVER mg/l
OX-1	9/8/2004 17:30	0.01 U	0.11	0.005 U	0.01 U	0.005 U	0.01 U	0.0002 U	0.01 U	0.011	0.005 U
OX-2	9/8/2004 17:10	0.01 U	0.1	0.005 U	0.01 U	0.005 U	0.01 U	0.0002 U	0.01 U	0.01 U	0.005 U
OX-3	9/8/2004 16:15	0.01 U	0.11	0.005 U	0.01 U	0.005 U	0.01 U	0.0002 U	0.01 U	0.01 U	0.005 U
OX-4	9/8/2004 15:40	0.01 U	0.11	0.005 U	0.01 U	0.005 U	0.01 U	0.0002 U	0.01 U	0.011	0.005 U
OX-5	9/8/2004 14:40	0.01 U	0.11	0.005 U	0.01 U	0.005 U	0.15	0.0002 U	0.01 U	0.016	0.005 U
OX-6	9/8/2004 12:30	0.01 U	0.094	0.005 U	0.01 U	0.005 U	0.087	0.0002 U	0.01 U	0.01 U	0.005 U
OX-7	9/8/2004 16:30	0.01 U	0.1	0.005 U	0.01 U	0.005 U	0.01 U	0.0002 U	0.01 U	0.01 U	0.005 U
OX-8	9/8/2004 16:45	0.01 U	0.11	0.005 U	0.01 U	0.005 U	0.01 U	0.0002 U	0.01 U	0.01 U	0.005 U
OX-9	9/8/2004 15:55	0.01 U	0.27	0.005 U	0.01 U	0.005 U	0.30	0.0002 U	0.01 U	0.01 U	0.005 U
OX-10	9/8/2004 14:55	0.01 U	0.11	0.005 U	0.01 U	0.005 U	0.28	0.0002 U	0.01 U	0.01 U	0.005 U
Frequency of Detection (%)		0%	100%	0%	0%	0%	40%	0%	0%	30%	0%
Maximum Detected Conc.		ND	0.27	ND	ND	ND	0.30	ND	ND	0.016	ND
Average Concentration			0.122				0.085			0.007	
BRD-1	9/8/2004 18:00	0.01 U	0.11	0.005 U	0.01 U	0.005 U	0.01 U	0.0002 U	0.01 U	0.01 U	0.005 U
BRU-1	9/8/2004 17:45	0.01 U	0.1	0.005 U	0.01 U	0.005 U	0.01 U	0.0002 U	0.01 U	0.01 U	0.005 U
EPA WQC ¹ freshwater CCC			NA				NA			0.005	
HH organism			NA				NA			4.2	
MO WQS ² AQL			NA				NA			0.005	
HHF			NA				NA			NA	

Definitions:

mg/l = milligrams per liter of dissolved analyte (except mercury which is total).
 BRD = Blue River Downstream Location
 BRU = Blue River Upstream Location
 U = Undetected at or above detection limit
 ND = Not Detected
 NA = Not Available; constituent not an ecological receptor of concern.

Notes:

1. EPA National Recommended Water Quality Criteria, Office of Water, U.S. Environmental Protection Agency, 2004.

Freshwater criteria is the Criterion Continuous Concentration (CCC), which is an estimate of the highest concentration of a material in surface water that an aquatic community can be exposed indefinitely without resulting in an unacceptable effect.

Human Health (HH) criteria is for consumption of organisms only and are based on a carcinogenicity of 10⁻⁶.

2. Missouri Department of Natural Resources, Division 20 - Clean Water Commission, Chapter 7 - Water Quality (10 CSR 20-7.031).

AQL = Protection of Aquatic Life

HHF = Human Health Protection - Fish Consumption

TABLE 4-7
MEDIUM-SPECIFIC EXPOSURE POINT CONCENTRATION SUMMARY FOR OFF-SITE AREA 1
Quality Analytical Services Site
Blue Summit, Missouri

Scenario Timeframe: Current/Future
Medium: Groundwater
Exposure Medium: Groundwater (Off-Site Area 1)

Exposure Point	Chemical of Potential Concern	Units	Arithmetic Mean	95% UCL of the Mean (Student's t-UCL)	Maximum Concentration	Exposure Point Concentration [1]			
						EPC Value	Units	Statistic [a]	Rationale [b]
Groundwater (On-site and Off-Site Area 1)	Arsenic	mg/l	0.011	0.013	0.03	0.017	mg/l	95% Chebyshev	Test(1)
	Benzene	mg/l	0.00059	0.00068	0.0025	0.00068	mg/l	student's t-test	Test(1)
	Cadmium	mg/l	0.00411	0.0049	0.014	0.0061	mg/l	95% Chebyshev	Test(1)
	cis-1,2-DCE	mg/l	0.018	0.029	0.19	0.082	mg/l	99% Chebyshev	Test(1)
	1,4-Dioxane	mg/l	0.286	0.434	2.80	1.16	mg/l	99% Chebyshev	Test(1)
	Lead	mg/l	0.015	0.019	0.059	0.0374	mg/l	99% Chebyshev	Test(1)
	Manganese	mg/l	0.864	1.17	6.40	1.17	mg/l	95% H-UCL	Test(2)
	MTBE	mg/l	0.0029	0.0038	0.015	0.0083	mg/l	99% Chebyshev	Test(1)
	Trichloroethylene	mg/l	0.0014	0.0022	0.019	0.0035	mg/l	95% Chebyshev	Test(1)
	Vinyl Chloride	mg/l	0.014	0.023	0.140	0.066	mg/l	99% Chebyshev	Test(1)

Notes:

[1] Exposure Point Concentrations (EPCs) calculated using EPA's on-line ProUCL Program.

Test(1) = The data were determined to be neither normally or lognormally distributed using Shapiro-Wilks (sample size <=50) or the Lillifors Test (sample size > 50); Non-Parametric value used.

Test(2) The data were determined to be normally distributed using Shapiro-Wilks Shapiro-Wilks (sample size <=50) or the Shapiro-Francia Calculation (sample size >

TABLE 4-8
MEDIUM-SPECIFIC EXPOSURE POINT CONCENTRATION SUMMARY FOR OFF-SITE AREA 2
Quality Analytical Services Site
Blue Summit, Missouri

Scenario Timeframe: Current/Future
Medium: Groundwater
Exposure Medium: Groundwater (Off-Site Area 2)

Exposure Point	Chemical of Potential Concern	Units	Arithmetic Mean	95% UCL of the Mean (95% UCL-N)	Maximum Concentration	Exposure Point Concentration [1]			
						EPC Value	Units	Statistic [a]	Rationale [b]
Groundwater (Off-Site Area 2)	Arsenic	mg/l	0.0211	0.026	0.088	0.027	mg/l	95% UCL- G	Test(2)
	Cadmium	mg/l	0.0046	0.0064	0.048	0.0094	mg/l	95% UCL- Cheb	Test(1)
	cis-1,2-DCE	mg/l	0.0059	0.010	0.12	0.032	mg/l	99% UCL- Cheb	Test(1)
	1,4-Dioxane	mg/l	0.044	0.057	0.24	0.061	mg/l	95% UCL- G	Test(2)
	Lead	mg/l	0.034	0.055	0.56	0.16	mg/l	99% UCL- Cheb	Test(1)
	Manganese	mg/l	2.65	3.716	25	9.0	mg/l	99% UCL- Cheb	Test(1)
	Trichloroethylene	mg/l	0.0011	0.0017	0.013	0.0025	mg/l	95% UCL- Cheb	Test(1)
	Vinyl Chloride	mg/l	7.48E-04	8.97E-04	0.003	0.0011	mg/l	95% UCL- Cheb	Test(1)

Notes:

[1] Exposure Point Concentrations (EPCs) calculated using EPA's on-line ProUCL Program.

[a] Statistics: 95% UCL of Normal Data (95% UCL-N); 95% UCL of Log-transformed Data (95% UCL-T); 95% or 99% UCL using Chebyshev stat (95%-Cheb)

[b] Statistical Test definitions:

Test(1) = The data were determined to be neither normally or lognormally distributed using Shapiro-Wilks (sample size ≤ 50) or the Lillifors Test (sample size > 50); Non-Parametric value used.

Test(2) = The data were determined to be gamma distributed using Shapiro-Wilks (sample size ≤ 50) or the Lillifors Test (sample size > 50); Gamma UCL used.

TABLE 4.9
MEDIUM-SPECIFIC EXPOSURE POINT CONCENTRATION SUMMARY
SOIL TO AMBIENT AIR CONCENTRATION (Volatilization + Dust)
CONSTRUCTION WORKER AND COMMERCIAL WORKER
Quality Analytical Services Site
Blue Summit, Missouri

Chemical of Potential Concern	Construction Worker		Indoor Comm/Ind Worker		Outdoor Comm/Ind Worker	
	Subsurface Soil (mg/kg)	CA (mg/m ³)	Surface Soil (mg/kg)	CA (mg/m ³)	Shallow Soil (mg/kg)	CA (mg/m ³)
Methylene Chloride	82.2	1.04E+00	ND		70.6	1.07E-01
1,1,2,2-Tetrachloroethane	ND		10.5	2.81E-03	8.8	2.37E-03

Equation: $CA = Cs \times (1/VF + 1/PEF)$

where: CA = concentration in air (mg/m³) calculated Cs = Concentration in soil (mg/kg) chem specific
VF = Volatilization Factor (m³/kg) calculated
PEF' = Particulate Emission Factor (m³/kg) 1.32E+08 EPA PEF divided by 10 for construction activities
PEF = Concentration of dust in air (m³/kg) 1.32E+09 USEPA, 1996 (Soil Screening Guidance, EPA/540/R-95/128)

$$VF = Q/C \times \frac{\sqrt{3.14 \times D_A \times T}}{(2 \times D_A \times \rho_b)} \times 10^4 (m^3 / cm^3)$$

where:

$$D_A = \frac{(\theta_a^{3.33} \cdot D_i \cdot H') + (\theta_w^{3.33} \cdot D_w)}{\eta^2} \cdot \frac{1}{((\rho_b \cdot K_d) + \theta_a + (\theta_w \cdot H'))}$$

Parameter (units)	Value	Source
Q/C = inverse of mean concentration at the center of a 30-acre-square source (g/m ³ per kg/m ³)	41.65 Lincoln, NE	USEPA, 1996
T = exposure interval (s)	construction worker commercial worker	2.6E+06 90 d; 8 hr/d 1.8E+08 250 d/y; 8 hr/d
D _A = effective diffusivity (cm ² /s)	calculated	
ρ _b = dry soil bulk density (g/cm ³)	1.50	EPA, 1996
ρ _s = soil particle density (g/cm ³)	2.65	EPA, 1996
θ _a = air-filled soil porosity (l _{por} /L _{soil})	0.28	EPA, 1996
D _i = diffusivity in air (cm ² /s)	chemical specific see below	EPA, 2002
H' = Dimensionless Henrys' law constant	chemical specific see below	EPA, 2002
θ _w = water-filled soil porosity (l _{por} /L _{soil})	0.15	EPA, 1996
D _w = diffusivity in water (cm ² /s)	chemical specific see below	EPA, 2002
n = total soil porosity (l _{por} /L _{soil})	0.43	EPA, 1996
K _d = soil water partition coefficient (cm ³ /g)	K _{oc} × f _{oc}	calculated
K _{oc} = organic carbon partition coefficient (cm ³ /g)	chemical-specific	EPA, 1996
f _{oc} = organic carbon content of soil (g/g)	0.006	EPA, 1996

TABLE 4.9
MEDIUM-SPECIFIC EXPOSURE POINT CONCENTRATION SUMMARY
SOIL TO AMBIENT AIR CONCENTRATION (Volatilization + Dust)
CONSTRUCTION WORKER AND COMMERCIAL WORKER
Quality Analytical Services Site
Blue Summit, Missouri

Chemical	Θ_a (cm ³ /cm ³)	Θ_w (cm ³ /cm ³)	D_i (cm ² /s)	D_w (cm ² /s)	H' (unitless)	η	ρ_b (g/cm ³)	K_{oc} (cm ³ /g)	K_d (cm ³ /g)	D_A (cm ² /s)
Methylene Chloride	0.28	0.15	1.01E-01	1.17E-05	8.98E-02	0.43	1.50	1.17E+01	7.02E-02	2.52E-03
1,1,2,2-Tetrachloroethane	0.28	0.15	7.10E-02	7.90E-06	1.41E-02	0.43	1.50	9.33E+01	5.60E-01	7.87E-05

Chemical	Q/C_{VF} (g/m ² -s)/(kg/m ³)	π	D_A (cm ² /s)	T (s)	2	ρ_b (g/cm ³)	10^{-4} (m ² /cm ²)	CW VF (m ³ /kg)
Methylene Chloride	41.65	3.14	2.52E-03	2.59E+06	2	1.50	1.00E-04	7.89E+01

Chemical	Q/C_{VF} (g/m ² -s)/(kg/m ³)	π	D_A (cm ² /s)	T (s)	2	ρ_b (g/cm ³)	10^{-4} (m ² /cm ²)	Comm Worker VF (m ³ /kg)
Methylene Chloride	41.65	3.14	2.52E-03	1.80E+08	2	1.50	1.00E-04	6.57E+02
1,1,2,2-Tetrachloroethane	41.65	3.14	7.87E-05	1.80E+08	2	1.50	1.00E-04	3.72E+03

Table 4-10
Domenico and BIOCHLOR Model Assumptions
Quality Analytical Services Site, Blue Summit, MO

Modeling Parameter	Value Used	Units	Rationale
Concentration of contaminant in groundwater at distance X from source (C_x)		µg/L	Calculated value
Concentration of contaminant in groundwater at source (C_{source})		µg/L	Chemical specific. Calculated 95% UCL value in each of two areas, Offsite Area 1 and Offsite Area 2
Distance along centerline of groundwater plume emanating from source (X)	700 (Area 1) 400 (Area 2)	Feet	Distance to "oxbow"
Distance along centerline of groundwater plume emanating from source (X)	1,900	ft	Distance to Blue River
Longitudinal Dispersivity (α_x)	70 (Area 1) 40 (Area 2)	Feet	Calculated value; function of X
Transverse Dispersivity (α_y)	7 (Area 1) 4 (Area 2)	Feet	Calculated value; function of X
Vertical Dispersivity (α_z)	0.001	Feet	Calculated value; function of X, default value for BIOCHLOR
First order degradation rate for chemical		1/day	Chemical specific. Anaerobic groundwater conditions.
Dry bulk density (ρ_b)	1.50	g/cc	MRBCA default value
Fraction of organic carbon (f_{oc})	0.006		MRBCA default value
Organic carbon partition coefficient (K_{oc})		cc/g	Chemical specific
Soil-water partition coefficient (K_d)		cc/g	Chemical specific
Groundwater seepage velocity		ft/day	Calculated value; $v = ki/n_e$
Constituent retardation factor (R)			Calculated value; $R = 1 + (\rho_b * K_d/n_e)$
Groundwater source term width (S_w)	233	Feet	Width of capped excavation perpendicular to groundwater flow
Groundwater source term thickness (S_d)	40 (A zone) 25 (B zone) 10 (C zone)	Feet	Average thickness of aquifer unit, based on site boring logs
Hydraulic conductivity (K)	0.004 (A zone) 0.03 (B zone) 0.011 (C zone)	ft/day	Site pump recovery data – November 14, 2003
Effective soil porosity (n_e)	0.15 (A zone) 0.2 (B zone) 0.2 (C zone)		Estimate based on lithology and pump test results
Gradient (i)	0.045/0.045 (A zone) 0.051/0.047 (B zone) 0.018/0.025 (C zone)		Site specific values (April 2007 – pumping scenario/November 2007 – non pumping scenario)

Table 4-11
Chemical-specific Parameters for Domenico and BIOCHLOR models
Quality Analytical Services Site
Blue Summit, MO

Constituent of Potential Concern	Chemical solubility (mg/L)	Source concentration Offsite Area 1 (mg/L)	Source concentration Offsite Area 2 (mg/L)	First order degradation constant (λ) (day ⁻¹)	K _{oc} or K _d (metals)
benzene	1.75×10^3	0.00068	----	0 (anaerobic)	58.9
1,4-dioxane	1.0×10^6	1.16	0.061	0	17
MTBE	5.1×10^4	0.0083	-----	0	11.2
TCE	1.1×10^3	0.0035	0.0025	1.6×10^{-3}	166
cis-1,2-dichloroethylene	3.5×10^3	0.082	0.032	4.4×10^{-3}	35.5
vinyl chloride	2.76×10^3	0.066	0.0011	4.0×10^{-3}	819
arsenic		0.0165	0.027	0	29
cadmium		0.0061	0.0094	0	75
manganese		1.17	8.9	0	50.1
lead		0.0374	0.16	0	890

Table 4-12a
BIOCHLOR Version 2.2 Fate and Transport Model Results
Quality Analytical Services Site
Blue Summit, MO

Aquifer Zone	COPC	Years	Calculated Downgradient Concentration (µg/L)					
			From Area 1 to oxbow		From Area 2 to oxbow		Blue River	
			Bio	No	Bio	No	Bio	No
A	TCE	6	0	0	0	0	0	0
	DCE		0	0	0	0	0	0
	VC		0	0	0	0	0	0
	TCE	24	0	0	0	0	0	0
	DCE		0	0	0	0	0	0
	VC		0	0	0	0	0	0
	TCE	50	0	0	0	0	0	0
	DCE		0	0	0	0	0	0
	VC		0	0	0	0	0	0
C	TCE	6	0	0	0	0	0	0
	DCE		0	0	0	0	0	0
	VC		0	0	0	0	0	0
	TCE	24	0	0	0	0	0	0
	DCE		0	0	0	0	0	0
	VC		0	0	0	0	0	0
	TCE	50	0	0	0	0	0	0
	DCE		0	0	0	0	0	0
	VC		0	0	0	0	0	0
B	TCE	6	0	0	0	0	0	0
	DCE		0	0	0	0	0	0
	VC		0	0	0	0	0	0
	TCE	24	0	0	0	0	0	0
	DCE		0	0	0	0	0	0
	VC		0	0	0	0	0	0
	TCE	50	0	0	0	0	0	0
	DCE		0	0	0	0	0	0
	VC		0	0	0	0	0	0

Notes:

COPC = constituent of potential concern

DCE = cis-1,2-dichloroethylene

Bio = biodegradation considered in model

Modeling conditions assume groundwater system is shut-down

Model domains: Offsite Area 1 to oxbow = 700'

Offsite Area 1 to Blue River = 1,900'

TCE = trichloroethylene

VC = vinyl chloride

No = biodegradation not considered in model

Offsite Area 2 to oxbow = 400'

Groundwater zones:

A = shallow groundwater zone (intercepted by surface water channels)

C = intermediate zone (intercepted by surface water channels, may not flow beyond Blue River)

B = deeper groundwater zone

Table 4-12b
Domenico Fate and Transport Model Results
Quality Analytical Services Site
Blue Summit, MO

Chemical	Source concentration	K _{oc} or K _d	R	Lambda	Downgradient Groundwater Concentrations	
	(mg/L)					Oxbow
Offsite Area 1 – All aquifer zones					(mg/L)	(mg/L)
1,4-dioxane	1.16	17	1.77	0	8.88E-01	6.11E-01
Benzene	0.00068	58.9	3.66	0	5.21E-04	3.58E-04
MTBE	0.0083	11.2	1.5	0	6.35E-03	4.37E-03
Arsenic	0.0165	29	218.5	0	1.26E-02	8.69E-03
Cadmium	0.0061	75	751	0	4.67E-03	3.21E-03
Manganese	1.17	50.1	376.75	0	8.96E-01	6.16E-01
Lead	0.0374	890	6676	0	2.86E-02	1.97E-02
Offsite Area 2 – All aquifer zones						
1,4-dioxane	0.061	17	2.02	0	5.89E-02	2.05E-02
Arsenic	0.027	29	291	0	2.61E-02	9.07E-03
Cadmium	0.009	75	751	0	9.08E-03	3.16E-03
Manganese	8.99	50.1	502	0	8.60E+00	2.99E+00
Lead	0.16	890	8,901	0	1.22E-01	5.37E-02

Notes: MTBE – methyl tert-butyl ether

All degradation rates (lambdas) are based on anaerobic conditions. Dissolved oxygen concentrations and other inorganic geochemical analyses performed on November 2006 samples indicate that the aquifer is anaerobic.

Modeled concentrations were used to evaluate potential risks associated with exposures at the oxbow.

TABLE 4.13
VALUES USED FOR DAILY INTAKE CALCULATIONS

Quality Analytical Services Site
Blue Summit, Missouri

Scenario Timeframe:	Future
Medium:	Surface Soil
Exposure Medium:	Surface Soil (Off-site Area 1)
Receptor Population:	Commercial Worker (Adult)

Exposure Route	Parameter Code	Parameter Definition	Units	RME Value		RME Rationale/Reference	Intake Equation/Model Name
				Indoor Worker	Outdoor Worker		
Ingestion	CS	Chemical concentration in soil	mg/kg	Chem. Specific	Chem. Specific	--	Intake (mg/kg/day) = $\frac{CS \cdot IR \cdot S \cdot CF3 \cdot ED \cdot EF \cdot FI}{BW \cdot AT}$
	IR-S	Ingestion Rate	mg/day	50	100	EPA, 2001	
	CF3	Conversion Factor 3	kg/mg	1.0E-06	1.0E-06	--	
	FI	Fraction Ingested	unitless	1	1		
	EF	Exposure Frequency	days/year	250	225	EPA, 2001	
	ED	Exposure Duration	years	25	25	EPA, 2001	
	BW	Body Weight	kg	70	70	EPA, 2001	
	AT-C	Averaging Time (Cancer)	days	25,550	25,550	EPA, 2001	
	AT-N	Averaging Time (Non-Cancer)	days	9125	9125	Based on ED	
Dermal	CS	Chemical concentration in soil	mg/kg	Chem. Specific	Chem. Specific	--	Dermally Absorbed Dose (mg/kg/day) = $\frac{CS \cdot SSAF \cdot DABS \cdot SA \cdot CF3 \cdot ED \cdot EF}{BW \cdot AT}$ Applicable only to non-VOC compounds COPCs in soil are VOCs
	CF3	Conversion Factor 3	kg/mg	1.0E-06	1.0E-06	--	
	SA	Skin Surface Available for Contact	cm ² /day	NA	3,300	EPA, 2001	
	SSAF	Soil to Skin Adherence Factor	mg/cm ² /event	NA	0.2	EPA, 2001	
	DABS	Absorption Factor	unitless	NA	Chem. Specific	USEPA, 2004	
	EF	Exposure Frequency	days/year	NA	225	EPA, 2001	
	ED	Exposure Duration	years	NA	25	EPA, 2001	
	BW	Body Weight	kg	NA	70	EPA, 2001	
	AT-C	Averaging Time (Cancer)	days	NA	25550	EPA, 2001	
	AT-N	Averaging Time (Non-Cancer)	days	NA	9125	Based on ED	
Inhalation ambient air	CA	Chemical Concentration in Air	mg/m ³	Table 4.9	Table 4.9	---	Intake (mg/kg/day) = $\frac{CA \cdot INR \cdot EF \cdot ED}{BW \cdot AT}$
	IR	Inhalation Rate	m ³ /day	NA	20	EPA, 2001	
	EF	Exposure Frequency	days/year	NA	225	EPA, 2001	
	ED	Exposure Duration	years	NA	25	EPA, 2001	
	BW	Body Weight	kg	NA	70	EPA, 2001	
	AT-C	Averaging Time (Cancer)	days	NA	25550	EPA, 2001	
	AT-N	Averaging Time (Non-Cancer)	days	NA	9125	Based on ED	

USEPA, 2004. Risk Assessment Guidance for Superfund. Volume I: Human Health Evaluation Manual. Supplemental Guidance. Dermal Risk Assessment.

USEPA, 2001. Supplemental Guidance for Developing Soil Screening Levels for Superfund Sites. OSWER 9355.4-24

TABLE 4.14
VALUES USED FOR DAILY INTAKE CALCULATIONS

Quality Analytical Services Site
Blue Summit, Missouri

Scenario Timeframe:	Future
Medium:	Sub/Surface Soil
Exposure Medium:	Subsurface Soil (Off-site Area 1)
Receptor Population:	Construction Worker

Exposure Route	Parameter Code	Parameter Definition	Units	RME Value	RME Rationale/ Reference	Intake Equation/ Model Name
Ingestion	CS	Chemical concentration in soil	mg/kg	Chemical Specific	--	Intake (mg/kg/day) = $\frac{CS \cdot IR \cdot S \cdot CF3 \cdot ED \cdot EF \cdot FI}{BW \cdot AT}$
	IR-S	Ingestion Rate	mg/day	330	USEPA, 2001b	
	CF3	Conversion Factor 3	kg/mg	1.0E-06	--	
	FI	Fraction Ingested	unitless	1.0		
	EF	Exposure Frequency	days/year	90	MDNR, 2005	
	ED	Exposure Duration	years	1.00	USEPA, 2001b	
	BW	Body Weight	kg	70	USEPA, 2001b	
	AT-C	Averaging Time (Cancer)	days	25,550	USEPA, 2001b	
	AT-N	Averaging Time (Non-Cancer)	days	365	Based on ED	
Dermal	CS	Chemical concentration in soil	mg/kg	Chemical Specific	--	Dermally Absorbed Dose (mg/kg/day) = $\frac{CS \cdot SSAF \cdot DABS \cdot SA \cdot CF3 \cdot ED \cdot EF}{BW \cdot AT}$ Applicable only to non-VOC compounds COPCs in soil are VOCs
	CF3	Conversion Factor 3	kg/mg	1.0E-06	--	
	SA	Skin Surface Available for Contact ¹	cm ²	3,300	USEPA, 2001b	
	SSAF	Soil to Skin Adherence Factor	mg/cm ² /event	0.3	USEPA, 2001b	
	DABS	Absorption Factor	unitless	Chemical Specific	USEPA, 2001a	
	EF	Exposure Frequency	days/year	90	MDNR, 2005	
	ED	Exposure Duration	years	1.00	USEPA, 2001b	
	BW	Body Weight	kg	70	USEPA, 2001b	
	AT-C	Averaging Time (Cancer)	days	25,550	USEPA, 2001b	
	AT-N	Averaging Time (Non-Cancer)	days	365	Based on ED	
Inhalation	CA	Chemical Concentration in Air	mg/m ³	Chemical Specific	---	Intake (mg/kg/day) = $\frac{CA \cdot INR \cdot EF \cdot ED}{BW \cdot AT}$
	IR	Inhalation Rate - Outdoor	m ³ /day	20	USEPA, 2001b	
	EF	Exposure Frequency	days/year	90	MDNR, 2005	
	ED	Exposure Duration	years	1.00	USEPA, 2001b	
	BW	Body Weight	kg	70	USEPA, 2001b	
	AT-C	Averaging Time (Cancer)	days	25,550	USEPA, 2001b	
	AT-N	Averaging Time (Non-Cancer)	days	365	Based on ED	

Notes:

1 - Assumes face, forearms, and hands are exposed.

Sources: USEPA, 2001a. Risk Assessment Guidance for Superfund. Volume I: Human Health Evaluation Manual. Supplemental Guidance. Dermal Risk Assessment.
USEPA, 2001b. Supplemental Guidance for Developing Soil Screening Levels for Superfund Sites. OSWER 9355.4-24

TABLE 4-15a
MEDIUM-SPECIFIC EXPOSURE POINT CONCENTRATION SUMMARY
Recreational User - Surface Water Scenario
QAS Facility, Blue Summit, MO

Scenario Timeframe:	Future
Medium:	Ground Water
Exposure Medium:	Surface Water
Exposure Area:	Blue River Oxbow

Chemical of Potential Concern	Units	Modeled Groundwater Concentration at Oxbow	Mixing Zone Dilution Factor	Estimated Surface Water Value
Arsenic	mg/L	2.61E-02	11%	2.79E-03
Cadmium	mg/L	9.08E-03	11%	9.99E-04
Manganese	mg/L	8.60E+00	11%	9.46E-01
Lead	mg/L	1.22E-01	11%	1.34E-02
Benzene	mg/L	5.21E-04	11%	5.73E-05
cis-1,2-Dichloroethylene	mg/L	NM	11%	NM
1,4-Dioxane	mg/L	8.88E-01	11%	9.77E-02
MTBE	mg/L	6.35E-03	11%	6.99E-04
Trichloroethylene	mg/L	NM	11%	NM
Vinyl chloride	mg/L	NM	11%	NM

(1) Maximum groundwater concentrations modeled from Off-site Area 1 or 2
using Biochlor/Domenico models.

NM = not measurable

TABLE 4-15b
VALUES USED FOR DAILY INTAKE CALCULATIONS
QAS Facility
Blue Summit, MO

Scenario Timeframe:	Future (assuming RS shutdown)
Medium:	Ground Water
Exposure Medium:	Surface Water
Exposure Point:	Oxbow
Receptor Population:	Recreational User
Receptor Age:	Adult

Exposure Route	Parameter Code	Parameter Definition	Units	RME Value	RME Rationale/ Reference	Intake Equation/ Model Name
Ingestion	C	Chemical Concentration in Surface Water	mg/L		Table 4-15a	Chronic Daily Intake (CDI) (mg/kg/day) = $\frac{C \cdot IR \cdot EF \cdot ED \cdot CF}{BW \cdot AT}$
	CF	Conversion Factor	mg/ug	1	--	
	IR	Ingestion Rate of Surface Water	L/day	0.05	Swimming, EPA, 1989	
	EF	Exposure Frequency	days/year	20	1 dy/wk for 5 months/yr	
	ED	Exposure Duration	years	24	USEPA, 1997	
	BW	Body Weight	kg	70	USEPA, 2004	
	AT-C	Averaging Time (Cancer)	days	25550	USEPA, 2004	
	AT-N	Averaging Time (Non-Cancer)	days	8760	USEPA, 2004	
Dermal	DAevent	Absorbed dose per event	mg/cm ² -event		Tables 4-16a & 4-16b	Dermally Absorbed Dose (mg/kg/day) $\frac{DAevent \times EV \times ED \times EF \times SA}{BW \cdot AT}$
	SA	Skin Surface Available for Contact	cm ²	18000	USEPA, 2004	
	EV	Event Frequency	events/day	1		
	EF	Exposure Frequency	days/year	20	1 dy/wk for 5 months/yr	
	ED	Exposure Duration	years	24	USEPA, 1997	
	BW	Body Weight	kg	70	USEPA, 2004	
	AT-C	Averaging Time (Cancer)	days	25550	USEPA, 2004	
	AT-N	Averaging Time (Non-Cancer)	days	8760	USEPA, 2004	

Sources:

USEPA, 1989: Risk Assessment Guidance for Superfund. Vol.1 Human Health Evaluation Manual, Part A. OERR. EPA/540/1-89/002.

USEPA, 1997: Exposure Factors Handbook. EPA/600/P-95/002Fa.

USEPA, 2004. Risk Assessment Guidance for Superfund. Volume I: Human Health Evaluation Manual. Supplemental Guidance. Dermal Risk Assessment.

TABLE 4-15c
VALUES USED FOR DAILY INTAKE CALCULATIONS
QAS Facility
Blue Summit, MO

Scenario Timeframe:	Future (assuming RS shutdown)
Medium:	Ground Water
Exposure Medium:	Surface Water
Exposure Point:	Oxbow
Receptor Population:	Recreational User
Receptor Age:	Child

Exposure Route	Parameter Code	Parameter Definition	Units	RME Value	RME Rationale/ Reference	Intake Equation/ Model Name
Ingestion	C	Chemical Concentration in Surface Water	mg/L		Table 4-15a	Chronic Daily Intake (CDI) (mg/kg/day) = $\frac{CGW \cdot IR \cdot EF \cdot ED \cdot CF}{BW \cdot AT}$
	CF	Conversion Factor		1	--	
	IR	Ingestion Rate of Surface Water	L/day	0.05	Swimming, EPA, 1989	
	EF	Exposure Frequency	days/year	20	1 dy/wk for 5 months/yr	
	ED	Exposure Duration	years	6	USEPA, 1994	
	BW	Body Weight	kg	15	USEPA, 2004	
	AT-N	Averaging Time (Non-Cancer)	days	2190	Based on ED	
Dermal	DAevent	Absorbed dose per event	mg/cm ² -event		Tables 4-16a & 4-16b	Dermally Absorbed Dose (mg/kg/day) $\frac{DAevent \times EV \times ED \times EF \times SA}{BW \cdot AT}$
	SA	Skin Surface Available for Contact	cm ²	6600	USEPA, 2004	
	EV	Event Frequency	events/day	1	USEPA, 2004	
	EF	Exposure Frequency	days/year	20	1 dy/wk for 5 months/yr	
	ED	Exposure Duration	years	6	USEPA, 2004	
	BW	Body Weight	kg	15	USEPA, 2004	
	AT-N	Averaging Time (Non-Cancer)	days	2190	Based on ED	

Sources:

USEPA, 1989: Risk Assessment Guidance for Superfund. Vol.1 Human Health Evaluation Manual, Part A. OERR. EPA/540/1-89/002.

USEPA, 1991: Risk Assessment Guidance for Superfund - Supplemental Guidance- Standard Default Exposure Factors Interim Final.

USEPA, 1997: Exposure Factors Handbook. EPA/600/P-95/002Fa

USEPA, 2004. Risk Assessment Guidance for Superfund. Volume I: Human Health Evaluation Manual. Supplemental Guidance. Dermal Risk Assessment.

TABLE 4-16a
ABSORBED DOSE (DAevent) CALCULATION FOR ORGANIC COMPOUNDS
 Recreational User - Surface Water Scenario
 QAS Facility, Blue Summit, MO

DAevent (mg/cm²-event) is calculated for organic compounds as follows:

$$\text{If } t_{\text{event}} \leq t^*, \text{ then } DA_{\text{event}} = 2 FA \times K_p \times C_w \times \sqrt{\frac{6 \tau_{\text{event}} \times t_{\text{event}}}{\pi}}$$

$$\text{If } t_{\text{event}} > t^*, \text{ then } DA_{\text{event}} = FA \times K_p \times C_w \left[\frac{t_{\text{event}}}{1+B} + 2 \tau_{\text{event}} \left(\frac{1+3B+3B^2}{(1+B)^2} \right) \right]$$

where: FA = Fraction Absorbed Water (dimensionless)
 K_p = Dermal Permeability Coefficient of Compound in water (cm/hr)

MW = Molecular Weight (g/mole)		K _p	MW	FA
Benzene	=	1.5E-02 cm/hr	78.10 g/mole	1.00
cis-1,2-Dichloroethylene	=	7.67E-03 cm/hr	96.90 g/mole	1.00
1,4-Dioxane	=	3.30E-04 cm/hr	88.10 g/mole	1.00
MTBE	=	2.570E-03 cm/hr	88.15 g/mole	1.00
Trichloroethylene	=	1.20E-02 cm/hr	131.40 g/mole	1.00
Vinyl chloride	=	5.60E-03 cm/hr	62.50 g/mole	1.00

C_w = Chemical Concentration in Water (mg/cm³)

$$\tau_{\text{event}} = 0.105 \times 10^{(0.0056 MW)}$$

τ_{event} = Lag time per event (hr/event)

Benzene	=	0.29 hr/event
cis-1,2-Dichloroethylene	=	0.37 hr/event
1,4-Dioxane	=	0.33 hr/event
MTBE	=	0.33 hr/event
Trichloroethylene	=	0.57 hr/event
Vinyl chloride	=	0.24 hr/event

t_{event} = Event Duration (hr/event)

1.00 hr/event

t* = Time to Reach Steady-state (hr)

$$B \leq 0.6, \text{ then } t^* = 2.4 \tau_{\text{event}}$$

Benzene	=	0.69 hr
cis-1,2-Dichloroethylene	=	0.88 hr
1,4-Dioxane	=	0.78 hr
MTBE	=	0.79 hr
Trichloroethylene	=	1.37 hr
Vinyl chloride	=	0.56 hr

B = Dimensionless ratio of permeability coefficient of compound

$$B = K_p \frac{\sqrt{MW}}{2.6} \text{ cm/hr}$$

Benzene	=	5.10E-02 cm/hr
cis-1,2-Dichloroethylene	=	2.90E-02 cm/hr
1,4-Dioxane	=	1.19E-03 cm/hr
MTBE	=	9.28E-03 cm/hr
Trichloroethylene	=	5.29E-02 cm/hr
Vinyl chloride	=	1.70E-02 cm/hr

DAevent = Benzene	1.34E-09 mg/cm ² -event
cis-1,2-Dichloroethylene	0.00E+00 mg/cm ² -event
1,4-Dioxane	5.33E-08 mg/cm ² -event
MTBE	2.96E-09 mg/cm ² -event
Trichloroethylene	0.00E+00 mg/cm ² -event
Vinyl chloride	0.00E+00 mg/cm ² -event

TABLE 4-16b
 ABSORBED DOSE (DA_{event}) CALCULATION FOR INORGANIC COMPOUNDS
 Recreational User - Surface Water Scenario
 QAS Facility, Blue Summit, MO

DA_{event} (mg/cm²-event) is calculated for inorganic compounds as follows:

$$DA_{event} = K_p \times C_w \times t_{event}$$

where:

C_w = Chemical Concentration in Water (mg/cm³)

K_p = Dermal Permeability Coefficient of Compound in water (cm/hr)

Arsenic = 0.001 cm/hr

Cadmium = 0.001 cm/hr

Manganese = 0.001 cm/hr

Lead = 0.0001 cm/hr

t_{event} = Event Duration (hr/event) 1.00 hr/event

DA event	Arsenic	=	2.79E-09
	Cadmium	=	9.99E-10
	Manganese	=	9.46E-07
	Lead	=	1.34E-09

USEPA, 2004. Risk Assessment Guidance for Superfund. Volume I: Human Health Evaluation Manual. Supplemental Guidance. Dermal Risk Assessment (RAGS Part E).

TABLE 4-17a
**INHALATION NON-CANCER AND CANCER TOXICITY DATA FOR
 COMMERCIAL & CONSTRUCTION WORKER SCENARIOS**
 Quality Analytical Services Site - Blue Summit, MO

Chemical of Potential Concern	Non-Cancer Toxicity Data						Cancer Toxicity Data					
	Subchronic Chronic/	Inhalation RfC mg/m ³	Adjustment (1)	Inhalation RfD mg/kg-day	Primary Target Organ	Source	Inhalation Unit Risk 1/(mg/m ³)	Adjustment (2)	Inhalation Cancer Slope Factor 1/(mg/kg-d)	Cancer Guideline Description	Source	Date
1,4-Dioxane	chronic	3.0E+00	RfDi x 70/20	8.57E-01	CSN, nasal	CalEPA	7.7E-03	SFi x 20/70	2.7E-02	B2	CalEPA	2005
Methylene chloride	chronic	3.0E+00	RfDi x 70/20	8.57E-01	Cardio,CSN	HEAST	4.7E-04	IUR x 70/20	1.65E-03	B2	IRIS	2007
1,1,2,2-Tetrachloroethane	chronic	2.1E-01	RfDi x 70/20	6.0E-02	Liver	PPRTV	5.8E-02	IUR x 70/20	2.03E-01	C	IRIS	2007
Trichloroethylene (upper bound)	chronic	4.0E-02	RfC x 20/70	1.14E-02	CSN, Liver	NCEA	1.1E-01	SFi x 20/70	4.0E-01	(3)	NCEA	2001
Trichloroethylene (lower bound)	chronic						3.1E-03	SFi x 20/70	1.1E-02	(3)	EPA	1987
Vinyl chloride - residential	chronic	1.0E-01	RfDi x 70/20	2.86E-02	Liver	IRIS	8.8E-03	IUR x 70/20	3.08E-02	A	IRIS	2007
Vinyl chloride - non-residential	chronic	1.0E-01			Liver	IRIS	4.4E-03	IUR x 70/20	1.54E-02	A	IRIS	2007

IRIS = Integrated Risk Information System; online database last updated January 25, 2007.

NCEA = National Center for Environmental Assessment

Cal EPA = California EPA

PPRTV = EPA's Provisional Peer Reviewed Toxicity Values

RfDi = Reference Dose - Inhalation

RfC = Reference Concentration

SFi = Cancer Slope Factor - Inhalation

(1) RfC mg/m³ (air) = RfDi (mg/kg-day) X 70 kg X 1/20 m³/day.

(2) Unit Risk (UR) per mg/m³ (air) = SFi (per mg/kg-day) X 1/70 kg X 20 m³/day.

(3) Risk estimates for TCE were calculated using a range of toxicity values, as recommended by EPA Region 7, where a SFi of 4.0E-01 (mg/kg-day)-1 and a RfC of 0.04 mg/m³ represents the upper bound from the 2001 TCE Tox Assessment and the EPA's original 1987 provisional value, a SFi of 1.1E-02 (mg/kg-day)-1 to represent the lower bound (LB) estimate.

Only the RfC of 0.04 mg/m³ was recommended by Region 7. According to the draft TCE Assessment, TCE is highly likely to produce cancer in humans

EPA Group:

A - Human carcinogen

B1 - Probable human carcinogen - indicates that limited human data are available

B2 - Probable human carcinogen - indicates sufficient evidence in animals and inadequate or no evidence in humans

C - Possible human carcinogen

D - Not classifiable as a human carcinogen

E - Evidence of noncarcinogenicity

TABLE 4-17b
 ORAL/DERMAL NON-CANCER AND CANCER TOXICITY DATA
 COMMERCIAL & CONSTRUCTION WORKER SCENARIOS
 Quality Analytical Services Site - Blue Summit, MO

Chemical of Potential Concern	Non-Cancer Toxicity Data								Cancer Toxicity Data					
	Subchronic Chronic/	Oral RfD mg/kg-d	Oral-Dermal Adjustment ABS _{Or} (1)	Dermal RfD mg/kg-day	Primary Target Organ	Combined UF/MF Factors	Source	Date	Cancer Slope Factor 1/(mg/kg-d)	Oral to Dermal Adjustment (1)	Dermal Slope Factor 1/(mg/kg-d)	Cancer Guideline Description	Source	Date
Methylene chloride	chronic	6.0E-02	1.0E+00	6.0E-02	Liver	100/1	IRIS	Jan-07	7.5E-03	1.0E+00	7.50E-03	B2	IRIS	Jan-07
1,1,2,2-Tetrachloroethane	chronic	6.0E-02	1.0E+00	6.0E-02			PPRTV		2.0E-01	1.0E+00	2.0E-01	C	IRIS	Jan-07

N/A = Not Available

IRIS = Integrated Risk Information System; online database last updated August 2005.

PPRTV = EPA's Provisional Peer Reviewed Toxicity Values

RfD = Reference Dose

SF = Cancer Slope Factor

(1) The oral toxicity values are applied without an adjustment factor to estimate the dermal toxicity value, if no data is available.

EPA Group:

A - Human carcinogen

B1 - Probable human carcinogen - indicates that limited human data are available

B2 - Probable human carcinogen - indicates sufficient evidence in animals and inadequate or no evidence in humans

C - Possible human carcinogen

D - Not classifiable as a human carcinogen

E - Evidence of noncarcinogenicity

TABLE 4-18
NON-CANCER AND CANCER TOXICITY DATA -- ORAL/DERMAL
QAS Facility
Blue Summit, MO

Chemical of Potential Concern	Chronic/ Subchronic	Oral RfD Value mg/kg-d	Oral to Dermal Adjustment Factor (1) ABS _{GI}	Dermal RfD mg/kg-d	Primary Target Organ	Combined UF/MF Factors	Sources of RfD:	Oral Cancer Slope Factor 1/(mg/kg-d)	Oral to Dermal Adjustment Factor	Dermal Cancer Slope Factor 1/(mg/kg-d)	EPA Group Cancer Guideline Description	Source
Arsenic	chronic	3.0E-04	1.0E+00	3.0E-04	Skin, Blood	3/1	IRIS	1.5E+00	1.0E+00	1.5E+00	A	IRIS
Cadmium (water)	chronic	5.0E-04	5% EPA	2.5E-05	kidney	10/1	IRIS	NA	1.0E+00	NA		
Manganese	chronic	2.4E-02	4% EPA	9.6E-04	CNS		IRIS	NA	1.0E+00	NA	D	IRIS
Lead	chronic	NA	1.0E+00	NA	Nerological dev.			NA	1.0E+00	NA		
Benzene	chronic	4.0E-03	1.0E+00	4.0E-03	Blood	300/1	IRIS	5.5E-02	1.0E+00	5.5E-02	A	IRIS
cis-1,2-Dichlorethylene	chronic	1.0E-02	1.0E+00	1.0E-02	Blood		PPRTV	NA	1.0E+00	NA	D	IRIS
1,4-Dioxane	chronic	NA	1.0E+00	NA				1.10E-02	1.0E+00	1.1E-02	B2	IRIS
MTBE	chronic	NA	1.0E+00	NA				1.80E-03	1.0E+00	1.8E-03		CalEPA
Trichloroethylene	chronic	3.0E-04	1.0E+00	3.0E-04			NCEA	4.0E-01	1.0E+00	4.0E-01		NCEA
Vinyl chloride	chronic	3.0E-03	1.0E+00	3.0E-03	Liver	30/1	IRIS	1.4E+00	1.0E+00	1.4E+00	A	IRIS

NA = Not Available

UF = Uncertainty Factor

MF = Modifying Factor

IRIS = Integrated Risk Information System; online database last updated January 25, 2007.

NCEA = National Center for Environmental Assessment

RfD = Reference Dose

Cal EPA = California EPA

SF = Cancer Slope Factor

PPRTV = EPA's Provisional Peer Reviewd Toxicity Values

(1) The oral toxicity values are applied without an adjustment factor to estimate the dermal toxicity value, if no data is available.

If gastrointestinal absorption factor is available, then

$RfD_d = RfD_o \times ABS_{GI}$

$SF_d = SF_o / ABS_{GI}$

EPA, 2004. Risk Assessment Guidance for Superfund. Volume I: Human Health Evaluation Manual. Part E Supplemental Guidance. Dermal Risk Assessment.

EPA Cancer Group:

A - Human carcinogen

B1 - Probable human carcinogen - indicates that limited human data are available

B2 - Probable human carcinogen - indicates sufficient evidence in animals and inadequate or no evidence in humans

C - Possible human carcinogen

D - Not classifiable as a human carcinogen

E - Evidence of noncarcinogenicity

TABLE 4-19a
 CALCULATION OF NON-CANCER HAZARDS
 REASONABLE MAXIMUM EXPOSURE
 Quality Analytical Services Site
 Blue Summit, Missouri

Scenario Timeframe:	Future
Medium:	Surface Soil
Exposure Medium:	Surface Soil (0-1)
Exposure Point:	Off-Site Area 1
Receptor Population:	Indoor Commercial Worker

Exposure Route	Chemical of Potential Concern	Medium EPC Value	Medium EPC Units	Route EPC Value	Route EPC Units	EPC Selected for Hazard Calculation (1)	Intake (2) (Non-Cancer)	Intake (Non-Cancer) Units	Reference Dose	Reference Dose Units	Hazard Quotient
Ingestion	1,1,2,2-Tetrachloroethane	10.47	mg/kg	10.47	mg/kg	M	5.1E-06	mg/kg/day	6.0E-02	mg/kg-day	0.000085
Total Hazard Index											0.00009

(1) Medium-Specific (M) EPC selected for hazard calculation. Route-Specific [R] EPC selected for calculation

(2) Exposure Parameters from Table 4-13.

Indoor Commerical Worker has minimal to no direct contact with soils, dermal and outdoor air inhalation routes are incomplete.

TABLE 4-19b
CALCULATION OF NON-CANCER HAZARDS
REASONABLE MAXIMUM EXPOSURE

Quality Analytical Services Site
Blue Summit, Missouri

Scenario Timeframe:	Future
Medium:	Surface Soil
Exposure Medium:	Shallow Soil (0-2)
Exposure Point:	Off-Site Area 1
Receptor Population:	Outdoor Commercial Worker

Exposure Route	Chemical of Potential Concern	Medium EPC Value	Medium EPC Units	Route EPC Value	Route EPC Units	EPC Selected for Hazard Calculation (1)	Intake (2) (Non-Cancer)	Intake (Non-Cancer) Units	Reference Dose	Reference Dose Units	Hazard Quotient
Ingestion	Methylene Chloride	70.63	mg/kg	70.63	mg/kg	M	6.2E-05	mg/kg/day	6.0E-02	mg/kg-day	0.0010
	1,1,2,2-Tetrachloroethane	8.82	mg/kg	8.82	mg/kg	M	7.8E-06	mg/kg/day	6.0E-02	mg/kg-day	0.00013
Dermal (4)	Methylene Chloride	70.63	mg/kg	DAevent 0.00E+00	mg/cm ² -event	M	NC	mg/kg/day		mg/kg-day	NC
	1,1,2,2-Tetrachloroethane	8.82	mg/kg		mg/cm ² -event	M	NC	mg/kg/day		mg/kg-day	NC
Inhalation ambient air	Methylene Chloride	70.63	mg/kg	1.07E-01	mg/m ³	R	1.9E-02	mg/kg/day	8.6E-01	mg/kg/day	0.022
	1,1,2,2-Tetrachloroethane	8.82	mg/kg	2.37E-03	mg/m ³	R	4.2E-04	mg/kg/day	6.0E-02	mg/kg/day	0.007
Total Hazard Index											0.03

- (1) Medium-Specific (M) EPC selected for hazard calculation. Route-Specific [R] EPC selected for calculation
- (2) Exposure Parameters from Table 4-13.
- (3) The DA is zero because the COPC is a VOC. EPA recommends that VOCs be assumed to fully volatilized (not absorbed dermally) and were assessed by the inhalation pathway (

TABLE 4-20a
CALCULATION OF CANCER RISKS
REASONABLE MAXIMUM EXPOSURE

Quality Analytical Services Site
Blue Summit, Missouri

Scenario Timeframe:	Current/Future
Medium:	Surface Soil
Exposure Medium:	Surface Soil (0-1)
Exposure Point:	Surface Soil & Dust (Area 1)
Receptor Population:	Indoor Commercial Worker

Exposure Route	Chemical of Potential Concern	Medium EPC Value	Medium EPC Units	Route EPC Value	Route EPC Units	EPC Selected for Risk Calculation (1)	Intake (2) (Cancer)	Intake (Cancer) Units	Cancer Slope Factor (3)	Cancer Slope Factor Units	Cancer Risk
Ingestion	1,1,2,2-Tetrachloroethane	10.47	mg/kg	10.5	mg/kg	M	1.8E-06	mg/kg/day	6.0E-02	mg/kg/day ⁻¹	1E-07
Total Risk Across All Exposure Routes/Pathways											1E-07

(1) Medium-Specific (M) EPC selected for hazard calculation of ingestion and dermal pathway and Route-Specific (R) EPC selected for inhalation pathway.

(2) Exposure Parameters from Tables 4.13.

Indoor Commercial Worker has minimal to no direct contact with soils, dermal and outdoor air inhalation routes are incomplete.

TABLE 4-20b
CALCULATION OF CANCER RISKS
REASONABLE MAXIMUM EXPOSURE

Quality Analytical Services Site
Blue Summit, Missouri

Scenario Timeframe:	Current/Future
Medium:	Surface Soil
Exposure Medium:	Shallow Soil (0-2)
Exposure Point:	Soil & Dust (Area 1)
Receptor Population:	Outdoor Commercial Worker

Exposure Route	Chemical of Potential Concern	Medium EPC Value	Medium EPC Units	Route EPC Value	Route EPC Units	EPC Selected for Risk Calculation (1)	Intake (2) (Cancer)	Intake (Cancer) Units	Cancer Slope Factor	Cancer Slope Factor Units	Cancer Risk
Ingestion	Methylene Chloride	70.63	mg/kg	70.6	mg/kg	M	2E-05	mg/kg/day	7.5E-03	mg/kg/day ⁻¹	2E-07
	1,1,2,2-Tetrachloroethane	8.82	mg/kg	8.8	mg/kg	M	3E-06	mg/kg/day	2.0E-01	mg/kg/day ⁻¹	6E-07
	Exposure Route Total										7E-07
Dermal	Methylene Chloride	70.63	mg/kg	DAevent	mg/cm ² -event	M	0.0E+00	mg/kg/day		mg/kg/day ⁻¹	NC
	1,1,2,2-Tetrachloroethane	8.82	mg/kg	0.00E+00						mg/kg/day ⁻¹	NC
Inhalation (ambient air)	Methylene Chloride	70.63	mg/kg	1E-01	mg/m ³	R	6.8E-03	mg/kg/day	1.6E-03	mg/kg/day ⁻¹	1E-05
	1,1,2,2-Tetrachloroethane	8.82	mg/kg	2E-03	mg/m ³	R	1.5E-04	mg/kg/day	2.0E-01	mg/kg/day ⁻¹	3E-05
	Exposure Route Total										4E-05
Total Risk Across All Exposure Routes/Pathways											4E-05

- (1) Medium-Specific (M) EPC selected for hazard calculation of ingestion and dermal pathway and Route-Specific (R) EPC selected for inhalation pathway.
(2) Exposure Parameters from Tables 4.13.

TABLE 4-21
CALCULATION OF NON-CANCER HAZARDS
REASONABLE MAXIMUM EXPOSURE

Quality Analytical Services Site
Blue Summit, Missouri

Scenario Timeframe:	Future
Medium:	Subsurface Soil
Exposure Medium:	Subsurface Soil and Dust
Exposure Point:	Off-Site Area 1
Receptor Population:	Construction Worker

Exposure Route	Chemical of Potential Concern	Medium EPC Value	Medium EPC Units	Route EPC Value	Route EPC Units	EPC Selected for Hazard Calculation (1)	Intake (2) (Non-Cancer)	Intake (Non-Cancer) Units	Reference Dose	Reference Dose Units	Hazard Quotient
Ingestion	Methylene Chloride	82.21	mg/kg	82.21	mg/kg	M	9.6E-05	mg/kg/day	6.0E-02	mg/kg-day	0.0016
Dermal (3)	Methylene Chloride	82.21	mg/kg	DAevent	mg/cm ² -event	M	NC	mg/kg/day	6.0E-02	mg/kg-day	NC
				0.00E+00							
Inhalation	Methylene Chloride	82.21	mg/kg	1.04E+00	mg/m ³	R	7.3E-02	mg/kg/day	8.6E-01	mg/kg/day	0.086
Total Hazard Index											0.087

- (1) Medium-Specific (M) EPC selected for hazard calculation. Route-Specific [R] EPC selected for calculation
- (2) Exposure Parameters from Table 4-14.
- (3) The DA is zero because the COPC is a VOC. EPA recommends that VOCs be assumed to fully volatilized (not absorbed dermally) and were assessed by the inhalation pathway (US

TABLE 4-22
CALCULATION OF CANCER RISKS
REASONABLE MAXIMUM EXPOSURE

Quality Analytical Services Site
Blue Summit, Missouri

Scenario Timeframe:	Future
Medium:	Subsurface Soil
Exposure Medium:	Subsurface Soil
Exposure Point:	Subsurface Soil & Dust (Area 1)
Receptor Population:	Construction Worker

Exposure Route	Chemical of Potential Concern	Medium EPC Value	Medium EPC Units	Route EPC Value	Route EPC Units	EPC Selected for Risk Calculation (1)	Intake (2) (Cancer)	Intake (Cancer) Units	Cancer Slope Factor	Cancer Slope Factor Units	Cancer Risk
Ingestion	Methylene Chloride	82.2	mg/kg	82.21	mg/kg	M	1.4E-06	mg/kg/day	7.5E-03	mg/kg/day ⁻¹	1.0E-08
Dermal	Methylene Chloride	82.2	mg/kg	DAevent	mg/cm ² -event	M	NC	mg/kg/day	7.5E-03	mg/kg/day ⁻¹	NC
				0.00E+00							
Inhalation	Methylene Chloride	82.2	mg/kg	1.04E+00	mg/m ³	R	1.0E-03	mg/kg/day	1.6E-03	mg/kg/day ⁻¹	1.7E-06
Total Risk Across All Exposure Routes/Pathways											2E-06

(1) Medium-Specific (M) EPC selected for hazard calculation of ingestion and dermal pathway and Route-Specific (R) EPC selected for inhalation pathway.

TABLE 4-23
SUMMARY OF INDOOR AIR RISK ESTIMATES ASSOCIATED WITH OFF-SITE GROUNDWATER CONCENTRATIONS
Quality Analytical Services Site
Blue Summit, MO

Chemical of Potential Concern	units	EXPOSURE AREA AND RISK ESTIMATES ¹									
		Off-Site Area 1 ²					Off-Site Area 2 ³				
		EPC Value	Estimated Cancer Risk		Hazard Index		EPC Value	Estimated Cancer Risk		Hazard Index	
Soil Pathway											
1,1,2,2-TCA	mg/kg	3.90	1E-10		2.32E-08						
Groundwater Pathway											
1,4-Dioxane	mg/L	1.16	3E-09		3.4E-07		0.061	6E-10		6.2E-08	
Trichloroethylene	mg/L	0.0035	2E-08 UB	2E-09 LB	6.3E-05 UB	1.3E-05 LB	0.0037	9E-08 UB	3E-09 LB	4.7E-05 UB	1.4E-05 LB
Vinyl Chloride	mg/L	0.066	4E-08		1.4E-04		0.0013	4.E-09		9.4E-06	
Groundwater Pathway Totals			6E-08	5E-08	2.0E-04	1.5E-04		9.E-08	7E-09	5.6E-05	2.3E-05

[1] Risk Estimates Calculated using the Johnson and Ettinger Model (USEPA, 2000). Updated spreadsheets 2004

[2] Estimated based on commercial indoor worker exposures.

[3] Off-site groundwater risks estimated based on residential land use exposures.

[4] Individual cancer risks for TCE estimated based on upper bound (UB) and lower bound (LB) toxicity values.

EPC = exposure point concentration based on 95th UCL

See Table 4-16 for upperbound and lower bound toxicity values associated with TCE estimates.

TABLE 4-24
CALCULATION OF NON-CANCER HAZARDS
REASONABLE MAXIMUM EXPOSURE
QAS Facility
Blue Summit, MO

Scenario Timeframe:	Future
Medium:	Surface Water
Exposure Medium:	Surface Water
Exposure Point:	Oxbow
Receptor Population:	Recreational User
Receptor Age:	Adult

Exposure Route	Chemical of Potential Concern	Medium EPC Value	Medium EPC Units	Route EPC Value	Route EPC Units	EPC Selected for Hazard Calculation (1)	Intake (Non-Cancer) mg/kg/day	Reference Dose (2) mg/kg/day	Hazard Quotient
Ingestion	Arsenic	2.79E-03	mg/L	2.79E-03	mg/L	M	1.1E-07	3.0E-04	4E-04
	Cadmium	9.99E-04	mg/L	9.99E-04	mg/L	M	3.9E-08	5.0E-04	8E-05
	Manganese	9.46E-01	mg/L	9.46E-01	mg/L	M	3.7E-05	2.4E-02	2E-03
	Lead	1.34E-02	mg/L	1.34E-02	mg/L	M	5.3E-07	NA	
	Benzene	5.73E-05	mg/L	5.73E-05	mg/L	M	2.2E-09	4.0E-03	6E-07
	cis-1,2-Dichlorethylene	NM	mg/L	NM	mg/L	M	0.0E+00	1.0E-02	0E+00
	1,4-Dioxane	9.77E-02	mg/L	9.77E-02	mg/L	M	3.8E-06	NA	
	MTBE	6.99E-04	mg/L	6.99E-04	mg/L	M	2.7E-08	NA	
	Trichloroethylene	NM	mg/L	NM	mg/L	M	0.0E+00	3.0E-04	0E+00
	Vinyl chloride	NM	mg/L	NM	mg/L	M	0.0E+00	3.0E-03	0E+00
	(Total)								0.002
Dermal				DAevent					
	Arsenic	2.79E-03	mg/L	2.79E-09	mg/cm ² -event	M	3.9E-08	3.0E-04	1E-04
	Cadmium	9.99E-04	mg/L	9.99E-10	mg/cm ² -event	M	1.4E-08	2.5E-05	6E-04
	Manganese	9.46E-01	mg/L	9.46E-07	mg/cm ² -event	M	1.3E-05	9.6E-04	1E-02
	Lead	1.34E-02	mg/L	1.34E-09	mg/cm ² -event	M	1.9E-08	NA	
	Benzene	5.73E-05	mg/L	1.34E-09	mg/cm ² -event	M	1.9E-08	4.0E-03	5E-06
	cis-1,2-Dichlorethylene	NM	mg/L	0.00E+00	mg/cm ² -event	M	0.0E+00	1.0E-02	0E+00
	1,4-Dioxane	9.77E-02	mg/L	5.33E-08	mg/cm ² -event	M	7.5E-07	NA	
	MTBE	6.99E-04	mg/L	2.96E-09	mg/cm ² -event	M	4.2E-08	NA	
	Trichloroethylene	NM	mg/L	0.00E+00	mg/cm ² -event	M	0.0E+00	3.0E-04	0E+00
	Vinyl chloride	NM	mg/L	0.00E+00	mg/cm ² -event	M	0.0E+00	3.0E-03	0E+00
	(Total)								0.015
									0.02

(1) Medium-Specific (M) EPC selected for hazard calculation.

TABLE 4-25
CALCULATION OF NON-CANCER HAZARDS
REASONABLE MAXIMUM EXPOSURE
QAS Facility
Blue Summit, MO

Scenario Timeframe:	Future
Medium:	Surface Water
Exposure Medium:	Surface Water
Exposure Point:	River Oxbow
Receptor Population:	Recreational User
Receptor Age:	Child

Exposure Route	Chemical of Potential Concern	Medium EPC Value	Medium EPC Units	Route EPC Value	Route EPC Units	EPC Selected for Hazard Calculation (1)	Intake (Non-Cancer) mg/kg/day	Reference Dose (2) mg/kg/day	Hazard Quotient
Ingestion	Arsenic	2.79E-03	mg/L	2.79E-03	mg/L	M	5.10E-07	3.0E-04	2E-03
	Cadmium	9.99E-04	mg/L	9.99E-04	mg/L	M	1.82E-07	5.0E-04	4E-04
	Manganese	9.46E-01	mg/L	9.46E-01	mg/L	M	1.73E-04	2.4E-02	7E-03
	Lead	1.34E-02	mg/L	1.34E-02	mg/L	M	2.45E-06	NA	
	Benzene	5.73E-05	mg/L	5.73E-05	mg/L	M	1.05E-08	4.0E-03	3E-06
	cis-1,2-Dichlorethylene	NM	mg/L	NM	mg/L	M	0.00E+00	1.0E-02	0E+00
	1,4-Dioxane	9.77E-02	mg/L	9.77E-02	mg/L	M	1.78E-05	NA	
	MTBE	6.99E-04	mg/L	6.99E-04	mg/L	M	1.28E-07	NA	
	Trichloroethylene	NM	mg/L	NM	mg/L	M	0.00E+00	3.0E-04	0E+00
	Vinyl chloride	NM	mg/L	NM	mg/L	M	0.00E+00	3.0E-03	0E+00
	(Total)								0.009
Dermal				DAevent					
	Arsenic	2.79E-03	mg/L	2.79E-09	mg/cm ² -event	M	6.7E-08	3.0E-04	2E-04
	Cadmium	9.99E-04	mg/L	9.99E-10	mg/cm ² -event	M	2.4E-08	2.5E-05	1E-03
	Manganese	9.46E-01	mg/L	9.46E-07	mg/cm ² -event	M	2.3E-05	9.6E-04	2E-02
	Lead	1.34E-02	mg/L	1.34E-09	mg/cm ² -event	M	3.2E-08	NA	
	Benzene	5.73E-05	mg/L	1.34E-09	mg/cm ² -event	M	3.2E-08	4.0E-03	8E-06
	cis-1,2-Dichlorethylene	NM	mg/L	0.00E+00	mg/cm ² -event	M	0.0E+00	1.0E-02	0E+00
	1,4-Dioxane	9.77E-02	mg/L	5.33E-08	mg/cm ² -event	M	1.3E-06	NA	
	MTBE	6.99E-04	mg/L	2.96E-09	mg/cm ² -event	M	7.1E-08	NA	
	Trichloroethylene	NM	mg/L	0.00E+00	mg/cm ² -event	M	0.0E+00	3.0E-04	0E+00
	Vinyl chloride	NM	mg/L	0.00E+00	mg/cm ² -event	M	0.0E+00	3.0E-03	0E+00
	(Total)								0.025
Total Hazard Index Across All Exposure Routes/Pathways									0.02

(1) Medium-Specific (M) EPC selected for hazard calculation.

TABLE 4-26
CALCULATION OF CANCER RISKS
REASONABLE MAXIMUM EXPOSURE

QAS Facility
Blue Summit, MO

Scenario Timeframe:	Future
Medium:	Surface Water
Exposure Medium:	Surface Water
Exposure Point:	Oxbow
Receptor Population:	Recreational Users - Lifetime

Exposure Route	Chemical of Potential Concern	Medium EPC Value	Medium EPC Units	Route EPC Value	Route EPC Units	EPC Selected for Risk Calculation (1)	Intake (Cancer) mg/kg/day	Cancer Slope Factor mg/kg/day ⁻¹	Cancer Risk
Ingestion	Arsenic	2.79E-03	mg/L	2.79E-03	mg/L	M	5.6E-08	1.50E+00	8E-08
	Cadmium	9.99E-04	mg/L	9.99E-04	mg/L	M	2.6E-08	NA	
	Manganese	9.46E-01	mg/L	9.46E-01	mg/L	M	1.5E-05	NA	
	Lead	1.34E-02	mg/L	1.34E-02	mg/L	M	5.9E-05	NA	
	Benzene	5.73E-05	mg/L	5.73E-05	mg/L	M	9.5E-10	5.50E-02	5E-11
	cis-1,2-Dichlorethylene	NM	mg/L	NM	mg/L	M	0.0E+00	NA	
	1,4-Dioxane	9.77E-02	mg/L	9.77E-02	mg/L	M	1.4E-04	1.10E-02	2E-06
	MTBE	6.99E-04	mg/L	6.99E-04	mg/L	M	1.1E-08	1.80E-03	2E-11
	Trichloroethylene	NM	mg/L	NM	mg/L	M	0.0E+00	4.00E-01	0E+00
	Vinyl chloride	NM	mg/L	NM	mg/L	M	0.0E+00	1.40E+00	0E+00
	(Total)								2E-06
Dermal				DAevent					
	Arsenic	2.79E-03	mg/L	2.79E-09	mg/cm ² -event	M	2.0E-08	1.50E+00	3E-08
	Cadmium	9.99E-04	mg/L	9.99E-10	mg/cm ² -event	M	9.3E-09	NA	
	Manganese	9.46E-01	mg/L	9.46E-07	mg/cm ² -event	M	5.4E-06	NA	
	Lead	1.34E-02	mg/L	1.34E-09	mg/cm ² -event	M	7.7E-09	NA	
	Benzene	5.73E-05	mg/L	1.34E-09	mg/cm ² -event	M	7.7E-09	5.50E-02	4E-10
	cis-1,2-Dichlorethylene	NM	mg/L	0.00E+00	mg/cm ² -event	M	0.0E+00	NA	
	1,4-Dioxane	9.77E-02	mg/L	5.33E-08	mg/cm ² -event	M	3.1E-07	1.10E-02	3E-09
	MTBE	6.99E-04	mg/L	2.96E-09	mg/cm ² -event	M	1.7E-08	1.80E-03	3E-11
	Trichloroethylene	NM	mg/L	0.00E+00	mg/cm ² -event	M	0.0E+00	4.00E-01	0E+00
	Vinyl chloride	NM	mg/L	0.00E+00	mg/cm ² -event	M	0.0E+00	1.40E+00	0E+00
	(Total)								3E-08
Total Risk Across All Exposure Routes/Pathways									2E-06

(1) Medium-Specific (M) EPC selected for hazard calculation.

TABLE 4-27
SUMMARY OF RECEPTOR RISKS AND HAZARDS FOR COPCs
REASONABLE MAXIMUM EXPOSURE
Quality Analytical Services Site
Blue Summit, Missouri

Scenario Timeframe:	Future
Exposure Point:	Off-Site Area 1
Receptor Population:	Construction Workers

Medium	Exposure Medium	Exposure Point	Chemical of Potential Concern	Off-Site Area 1									
				Carcinogenic Risk				Chemical of Potential Concern	Non-Carcinogenic Hazard Quotient				
				Ingestion	Inhalation	Dermal	Exposure Routes Total		Primary Target Organ	Ingestion	Inhalation	Dermal	Exposure Routes Total
Soil	Subsurface Soil	Soil & Dust	Methylene Chloride	1.0E-08	1.7E-06	0.0E+00	1.7E-06	Methylene Chloride	Liver	1.6E-03	8.6E-02	0.0E+00	0.09
Total Risk Across All Media and All Exposure Routes							2E-06	Total Hazard Index Across Media and Exposure Routes					0.09

TABLE 4-28
SUMMARY OF RECEPTOR RISKS AND HAZARDS FOR COPCs
REASONABLE MAXIMUM EXPOSURE
Quality Analytical Services Site
Blue Summit, Missouri

Scenario Timeframe:	Current/Future
Exposure Point:	Off-Site Area 1
Receptor Population:	Commercial Workers

Medium	Exposure Medium	Exposure Point	Chemical of Potential Concern	Off-Site Area 1 - Indoor Workers									
				Carcinogenic Risk				Chemical of Potential Concern	Non-Carcinogenic Hazard Quotient				
				Ingestion	Inhalation	Dermal	Exposure Routes Total		Primary Target Organ	Ingestion	Inhalation	Dermal	Exposure Routes Total
Soil	Subsurface Soil	Indoor Air	1,1,2,2-Tetrachloroethane		1E-10		1E-10	1,1,2,2-Tetrachloroethane	Liver		2.3E-08		2.3E-08
	Surface Soil	Soil & Dust	1,1,2,2-Tetrachloroethane	1E-07			1E-07	1,1,2,2-Tetrachloroethane	Liver	8.5E-05			8.5E-05
			Total Pathway Risk	1E-07	1E-10		1E-07	Total Hazard Index		8.5E-05	2.3E-08		8.5E-05
Groundwater	Air	Indoor Air	1,4-Dioxane		3.0E-09		3.0E-09	1,4-Dioxane	CSN, nasal		3.4E-07		3.4E-07
			Vinyl Chloride		2.0E-08		2.0E-08	Vinyl Chloride	Liver		6.3E-05		6.3E-05
			Trichloroethylene		4.0E-08		4.0E-08	Trichloroethylene	Liver		1.4E-04		1.4E-04
			Total Pathway Risk		6E-08		6E-08	Total Hazard Index			2.0E-04		2.0E-04
Total Risk Across All Media and Exposure Routes							2E-07	Total Hazard Index Across Media, Exposure Routes, and Target Organs					Total HI = 0.0003

Medium	Exposure Medium	Exposure Point	Chemical of Potential Concern	Off-Site Area 1 - Outdoor Workers										
				Carcinogenic Risk				Chemical of Potential Concern	Non-Carcinogenic Hazard Quotient					
				Ingestion	Inhalation (ambient)	Dermal	Exposure Routes Total		Primary Target Organ	Ingestion	Inhalation (ambient)	Dermal	Exposure Routes Total	
Soil	Shallow Subsurface Soil	Soil & Dust	Methylene Chloride	1.7E-07	1.1E-05	0.0E+00	1E-05	Methylene Chloride	Liver	1.0E-03	2.2E-02	0.0E+00	0.023	
			1,1,2,2-Tetrachloroethane	5.5E-07	3.0E-05	0.0E+00	3E-05	1,1,2,2-Tetrachloroethane	Liver	1.3E-04	7.0E-03	0.0E+00	0.007	
			Total Risk Across All Media and Exposure Routes				4E-05	Total Hazard Index Across Media, Exposure Routes, and Target Organs					Total HI =	0.03

TABLE 5-1
 ECOLOGICAL EXPOSURE PATHWAY ANALYSIS
 QUALITY ANALYTICAL SERVICES Site
 Blue Summit, Missouri

Scenario Timeframe	Source Medium	Exposure Medium	Exposure Point	Exposure Route	Exposure Areas	Potential		Corresponding Exposure Rationale and Analysis
						Receptor Aquatic Ecological	Population Terrestrial Ecological	
Current	Groundwater	Surface Water	Oxbow of the Blue River	Ingestion	Off-Site	√	√	Detected constituents in surface water were compared to generic water quality criteria.
				Dermal Absorption	Off-Site	√	●	
		Sediments	Oxbow of the Blue River	Ingestion	Off-Site	√	○	Detected constituents in sediments were compared to generic sediment quality criteria.
				Dermal Absorption	Off-Site	√	○	

- √ Potentially complete exposure pathway; however migration pathway not confirmed.
- Potentially complete exposure pathway but not significant
- Incomplete exposure pathway

Table 5-2a
Summary of Oxbow Surface Water Sample Results
Quality Analytical Services Site
Blue Summit, MO

SAMPLE NUMBER	DATE OF COLLECTION	ARSENIC		BARIUM		CADMIUM		CHROMIUM		LEAD		MANGANESE		MERCURY		NICKEL		SELENIUM		SILVER	
		total mg/l	dissolved	total mg/l	dissolved	total mg/l	dissolved	total mg/l	dissolved	total mg/l	dissolved	total mg/l	dissolved	total mg/l	dissolved	total mg/l	dissolved	total mg/l	dissolved	total mg/l	dissolved
OX-1	9/8/2004 17:30	0.01 U	0.01 U	0.16	0.11	0.005 U	0.005 U	0.01 U	0.01 U	0.0077	0.005 U	1.7	0.01 U	0.0002 U	0.0002 U	0.01 U	0.01 U	0.011	0.011	0.005 U	0.005 U
OX-2	9/8/2004 17:10	0.01 U	0.01 U	0.11	0.1	0.005 U	0.005 U	0.01 U	0.01 U	0.005 U	0.005 U	0.34	0.01 U	0.0002 U	0.0002 U	0.01 U	0.01 U	0.01 U	0.01 U	0.005 U	0.005 U
OX-3	9/8/2004 16:15	0.01 U	0.01 U	0.12	0.11	0.005 U	0.005 U	0.01 U	0.01 U	0.005 U	0.005 U	0.44	0.01 U	0.0002 U	0.0002 U	0.01 U	0.01 U	0.01 U	0.01 U	0.005 U	0.005 U
OX-4	9/8/2004 15:40	0.01 U	0.01 U	0.11	0.11	0.005 U	0.005 U	0.01 U	0.01 U	0.005 U	0.005 U	0.48	0.01 U	0.0002 U	0.0002 U	0.01 U	0.01 U	0.017	0.011	0.005 U	0.005 U
OX-5	9/8/2004 14:40	0.01 U	0.01 U	0.18	0.11	0.005 U	0.005 U	0.01 U	0.01 U	0.02	0.005 U	1	0.15	0.0002 U	0.0002 U	0.01 U	0.01 U	0.012	0.016	0.005 U	0.005 U
OX-6	9/8/2004 12:30	0.01 U	0.01 U	0.13	0.094	0.005 U	0.005 U	0.01 U	0.01 U	0.0053	0.005 U	1.5 J6	0.087	0.0002 U	0.0002 U	0.01 U	0.01 U	0.01 U	0.01 U	0.005 U	0.005 U
OX-7	9/8/2004 16:30	0.01 U	0.01 U	0.12	0.1	0.005 U	0.005 U	0.01 U	0.01 U	0.005 U	0.005 U	0.42	0.01 U	0.0002 U	0.0002 U	0.01 U	0.01 U	0.01 U	0.01 U	0.005 U	0.005 U
OX-8	9/8/2004 16:45	0.01 U	0.01 U	0.11	0.11	0.005 U	0.005 U	0.01 U	0.01 U	0.005 U	0.005 U	0.36	0.01 U	0.0002 U	0.0002 U	0.01 U	0.01 U	0.01 U	0.01 U	0.005 U	0.005 U
OX-9	9/8/2004 15:55	0.01 U	0.01 U	0.12	0.27	0.005 U	0.005 U	0.01 U	0.01 U	0.005 U	0.005 U	0.63	0.30	0.0002 U	0.0002 U	0.01 U	0.01 U	0.01 U	0.01 U	0.005 U	0.005 U
OX-10	9/8/2004 14:55	0.01 U	0.01 U	0.23	0.11	0.005 U	0.005 U	0.012	0.01 U	0.039	0.005 U	1.8	0.28	0.0002 U	0.0002 U	0.01 U	0.01 U	0.01 U	0.01 U	0.005 U	0.005 U
BRD-1	9/8/2004 18:00	0.01 U	0.01 U	0.13	0.11	0.005 U	0.005 U	0.01 U	0.01 U	0.005 U	0.005 U	0.31	0.01 U	0.0002 U	0.0002 U	0.01 U	0.01 U	0.01 U	0.01 U	0.005 U	0.005 U
BRU-1	9/8/2004 17:45	0.01 U	0.01 U	0.12	0.1	0.005 U	0.005 U	0.01 U	0.01 U	0.005 U	0.005 U	0.13	0.01 U	0.0002 U	0.0002 U	0.01 U	0.01 U	0.01 U	0.01 U	0.005 U	0.005 U

Definitions:
mg/l = milligrams per liter
BRD = Blue River Downstream Location
BRU = Blue River Upstream Location
U = Not detected at or above detection limit
J6 = Matrix interference; spike value is low.
ND = Not Detected
NA = Not Available

Table 5-2b
Comparison of Oxbow Surface Water Samples to Screening Levels
Quality Analytical Services Site
Blue Summit, MO

SAMPLE NUMBER	DATE OF COLLECTION	units	BARIUM		CHROMIUM		LEAD		MANGANESE		SELENIUM	
			total	dissolved	total	dissolved	total	dissolved	total	dissolved	total	dissolved
OX-1	9/8/2004 17:30	mg/L	0.16	0.11	0.01 U	0.01 U	0.0077	0.005 U	1.7	0.01 U	0.011	0.011
OX-2	9/8/2004 17:10	mg/L	0.11	0.1	0.01 U	0.01 U	0.005 U	0.005 U	0.34	0.01 U	0.01 U	0.01 U
OX-3	9/8/2004 16:15	mg/L	0.12	0.11	0.01 U	0.01 U	0.005 U	0.005 U	0.44	0.01 U	0.01 U	0.01 U
OX-4	9/8/2004 15:40	mg/L	0.11	0.11	0.01 U	0.01 U	0.005 U	0.005 U	0.48	0.01 U	0.017	0.011
OX-5	9/8/2004 14:40	mg/L	0.18	0.11	0.01 U	0.01 U	0.02	0.005 U	1	0.15	0.012	0.016
OX-6	9/8/2004 12:30	mg/L	0.13	0.094	0.01 U	0.01 U	0.0053	0.005 U	1.5 J6	0.087	0.01 U	0.01 U
OX-7	9/8/2004 16:30	mg/L	0.12	0.1	0.01 U	0.01 U	0.005 U	0.005 U	0.42	0.01 U	0.01 U	0.01 U
OX-8	9/8/2004 16:45	mg/L	0.11	0.11	0.01 U	0.01 U	0.005 U	0.005 U	0.36	0.01 U	0.01 U	0.01 U
OX-9	9/8/2004 15:55	mg/L	0.12	0.27	0.01 U	0.01 U	0.005 U	0.005 U	0.63	0.30	0.01 U	0.01 U
OX-10	9/8/2004 14:55	mg/L	0.23	0.11	0.012	0.01 U	0.039	0.005 U	1.8	0.28	0.01 U	0.01 U
Maximum Detected Conc.		mg/L	0.23	0.27	0.012	ND	0.039	ND	1.8	0.3	0.017	0.016
Average Concentration *		mg/L	0.14	0.12			0.010		0.87	0.09	0.011	0.0108
Standard Deviation			0.04	0.05			0.011		0.59	0.12	0.002	0.002
BRD-1	9/8/2004 18:00	mg/L	0.13	0.11	0.01 U	0.01 U	0.005 U	0.005 U	0.31	0.01 U	0.01 U	0.01 U
BRU-1	9/8/2004 17:45	mg/L	0.12	0.1	0.01 U	0.01 U	0.005 U	0.005 U	0.13	0.01 U	0.01 U	0.01 U
Is analyte comparable to upgradient concentrations?			Yes	Yes	Yes	Yes	No	Yes	No	No	Yes	Yes
EPA WQC ¹ chronic		mg/L					0.0025		NA			
MO WQC ²		mg/L					0.003 h		0.05 GW			
NOAA ³ freshwater CCC		mg/L							0.12			

Notes:

- EPA National Recommended Ambient Water Quality Criteria for Freshwater, Office of Water, U.S. Environmental Protection Agency, 2004.
Freshwater criteria is the Criterion Continuous Concentration (CCC), which is an estimate to the highest concentration of a material in surface water that an aquatic community can be exposed indefinitely without resulting in an unacceptable effect.
Human Health (HH) criteria is for consumption of organisms only and are based on a carcinogenicity of 10⁻⁶.
D = Criteria for metals expressed in terms of dissolved metal in the water column.
- Missouri Department of Natural Resources, Division 20 - Clean Water Commission, Chapter 7 - Water Quality (10 CSR 20-7.031).
GW = groundwater criteria
h = hardness dependent, assumed hardness of 100 though likely higher for the region.
- Buchman, M.F., 1999. NOAA Screening Quick Reference Tables, NOAA HAZMAT Report 99-1, Seattle WA, Coastal Protection and Restoration Division, National Oceanic and Atmospheric Administration, 12 pages. Updated Nov. 2006.
* = Average concentration calculated assuming non-detects present at detection limit

Definitions:

mg/l = milligrams per liter
BRD = Blue River Downstream Location
BRU = Blue River Upstream Location
U = Not detected at or above detection limit
J6 = Matrix interference; spike value is low.
ND = Not Detected
NA = Not Available

Table 5-3
Comparison of Oxbow Sediment Samples to Sediment Screening Levels
Quality Analytical Services Site
Blue Summit, MO

SAMPLE NUMBER	DATE OF COLLECTION	ARSENIC mg/kg	BARIUM mg/kg	CADMIUM mg/kg	CHROMIUM mg/kg	LEAD mg/kg	MANGANESE mg/kg	MERCURY mg/kg	NICKEL mg/kg	SELENIUM mg/kg	SILVER mg/kg
OX-1	9/8/2004 17:30	4.2	110	0.3	12	40	310	0.038	21	6.2	0.25 U
OX-2	9/8/2004 17:10	3.1	120	0.25 U	10	17	250	0.023	19	5.1	0.25 U
OX-3	9/8/2004 16:15	5.5	120	0.25 U	15	39	340	0.034	27	7.4	0.25 U
OX-4	9/8/2004 15:55	4.4	120	0.37	14	43	240	0.11	24	6.2	0.25 U
OX-5	9/8/2004 14:40	3.6	110	0.31	11	30	200	0.04	20	5.5	0.25 U
OX-6	9/8/2004 12:30	4.3	120	0.44	14 J3	44 J5	270	0.05	24 J3	6.6 J3J6	0.25 U
OX-7	9/8/2004 16:30	5.4	120	0.28	13	36	280	0.036	24	7.1	0.25 U
OX-8	9/8/2004 16:45	5.3	120	0.3	13	34	270	0.039	22	5.5	0.25 U
OX-9	9/8/2004 15:55	4.4	130	0.33	12	51	240	0.035	20	5.6	0.25 U
OX-10	9/8/2004 14:55	3.6	99	0.32	12	37	230	0.035	18	5.3	0.25 U
Maximum Detected Conc (MDC)		5.5	130	0.44	15	51	340	0.11	27	7.4	ND
Geometric Mean ¹		4.3	116.6	0.27	12.5	35.8	260	0.04	21.7	6.0	
Background Levels ²		8.7	580	<1	54	20	740	0.039	14.0	0.28	NA
Is Mean > Background?		No	No	No	No	Yes	No	No	Yes	Yes	
Sediment Quality Guidelines (SQGs) ³		9.8	NA	0.99	43.4	35.8	460	0.18	22.7	2.5 *	1.6
Is MDC > SQG TEC?		No	NA	No	No	Yes	No	No	Yes	Yes	No
Is Mean > SQG TEC?		No	NA	No	No	No	No	No	No	Yes	No
SQGs based on PECs						128			48.6	>4 **	
Is MDC > SQG PEC?						No			No	Yes	

Notes: mg/kg = milligrams per kilogram

1. Average/Mean concentrations were calculated using one-half the detection limit (DL) of non-detected values.

2. Tidball, Ronald, R., 1984, Geochemical Survey of Missouri: Geography of Soil Geochemistry and Classification by Factor Analysis of Missouri Agricultural Soils (USGS Professional Paper 954-H, I.)

3. MacDonald, D.D., C.G. Ingersoll, and T.A. Berger. 2000a. Development and evaluation of consensus-based sediment quality guidelines for freshwater ecosystems. Arch. Environ. Contam. Toxicol. 39:20-31.

TEC = Threshold Effect Concentrations: concentrations of sediment-associated contaminants below which adverse effects on sediment-dwelling organisms are not expected to occur.

PEC = Probable Effect Concentrations: concentrations of sediment-associated contaminants above which adverse effects on sediment-dwelling organisms are likely to be observed.

* Toxic effects threshold for 10th percentile (EC10) for fish and birds in freshwater aquatic systems (USDOI, 1998).

** Toxic effects threshold for 100th percentile (EC100) for fish and birds in freshwater aquatic systems (USDOI, 1998).

U = Not detected at or above detection limit

J3 = Quality control outside the established QC range for precision.

J5 = Matrix interference; spike value is high.

J6 = Matrix interference; spike value is low.

Table 5-4
Comparison of Modeled Groundwater to Oxbow Concentrations to Surface Water Screening Levels
Quality Analytical Services Site
Blue Summit, MO

COPCs in Groundwater		Modeled Concentration to Oxbow				Eco Screening Levels (ESLs)				Is GWox >	Is SWox >	
		Model	Maximum GW _{oxbow}	DF	SW _{oxbow}	AWQC ⁽¹⁾ CCC	MO WQC ⁽²⁾	NOAA ⁽³⁾ CCC	Ecotox Thresholds ⁽⁴⁾		Lowest ESL?	Max ESL?
									Tier II	AWQC/FCV		
arsenic	mg/L	Domenico	0.0261	0.11	0.0028	0.15					No	No
benzene	mg/L	Domenico	0.00052	0.11	0.000056				0.046		No	No
cadmium	mg/L	Domenico	0.0091	0.11	0.00097	0.00025 D				0.001 h	Yes	No
cis-1,2-DCE	mg/L	Biochlor	NM	0.11	NM						NA	NA
1,4-dioxane	mg/L	Domenico	0.89	0.11	0.095						NA	NA
lead	mg/L	Domenico	0.12	0.11	0.013	0.0025 D					Yes	Yes
manganese	mg/L	Domenico	8.6	0.11	0.92		0.05 DW	0.12	0.08		Yes	Yes
MTBE	mg/L	Domenico	0.0064	0.11	0.00068						NA	NA
TCE	mg/L	Biochlor	NM	0.11	NM				0.35		No	No
vinyl chloride	mg/L	Biochlor	NM	0.11	NM						NA	NA

mg/L = milligrams per liter

GWox = Modeled groundwater concentration to the oxbow

SWox = Estimated surface water concentration from the groundwater

DF = Dilution factor (see Text)

NA = Not Available

NM = modeled concentration too low to measure

1. EPA National Recommended Ambient Water Quality Criteria (AWQC) for Freshwater, Office of Water, U.S. Environmental Protection Agency, 2006.

Freshwater criteria is the Criterion Continuous Concentration (CCC), which is an estimate to the highest concentration of a material in surface water that an aquatic community can be exposed indefinitely without resulting in an unacceptable effect.

D = Criteria for metals expressed in terms of dissolved metal in the water column. Hardness dependent, assumes hardness of 100.

2. Missouri Department of Natural Resources, Division 20 - Clean Water Commission, Chapter 7 - Water Quality (10 CSR 20-7.031).

DW = Drinking water level (non-risk-based)

3. Buchman, M.F., 1999. NOAA Screening Quick Reference Tables, NOAA HAZMAT Report 99-1, Seattle WA, Coastal Protection and Restoration Division, National Oceanic and Atmospheric Administration, 12 pages. Updated Nov. 2006.

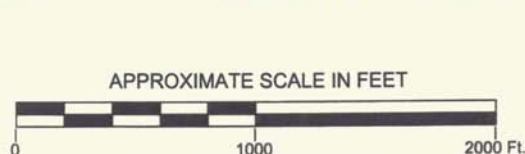
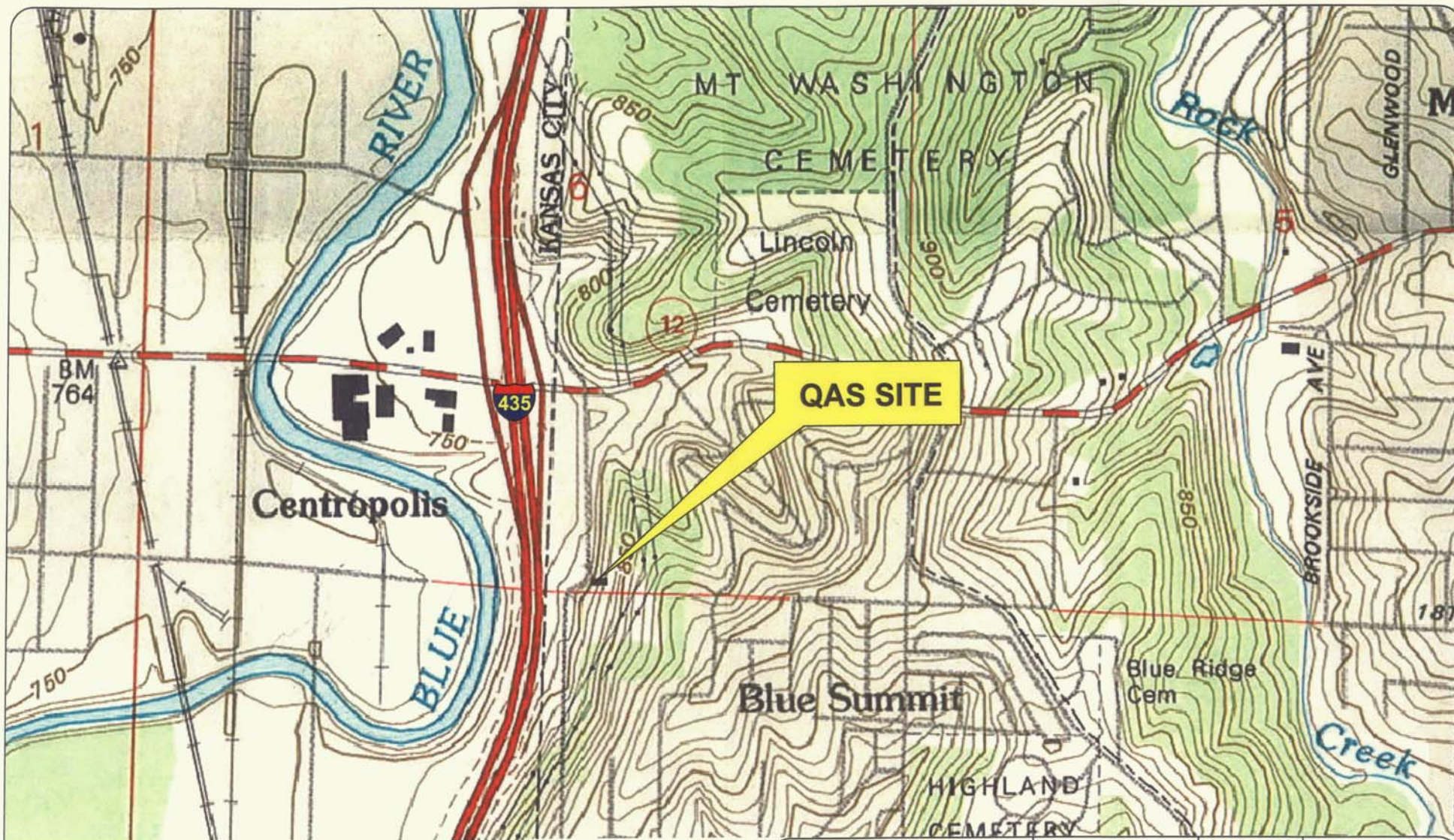
4. USEPA Eco Update, OSWER, EPA 540/F-95/038, January 1996.

Tier II Values calculated using Great Lakes Water Quality Initiative Tier II methodology (40 CFR 9 et al.).

FCV: Final Chronic Value

h = hardness dependent, assumed hardness of 100 though likely higher for the region.

FIGURES

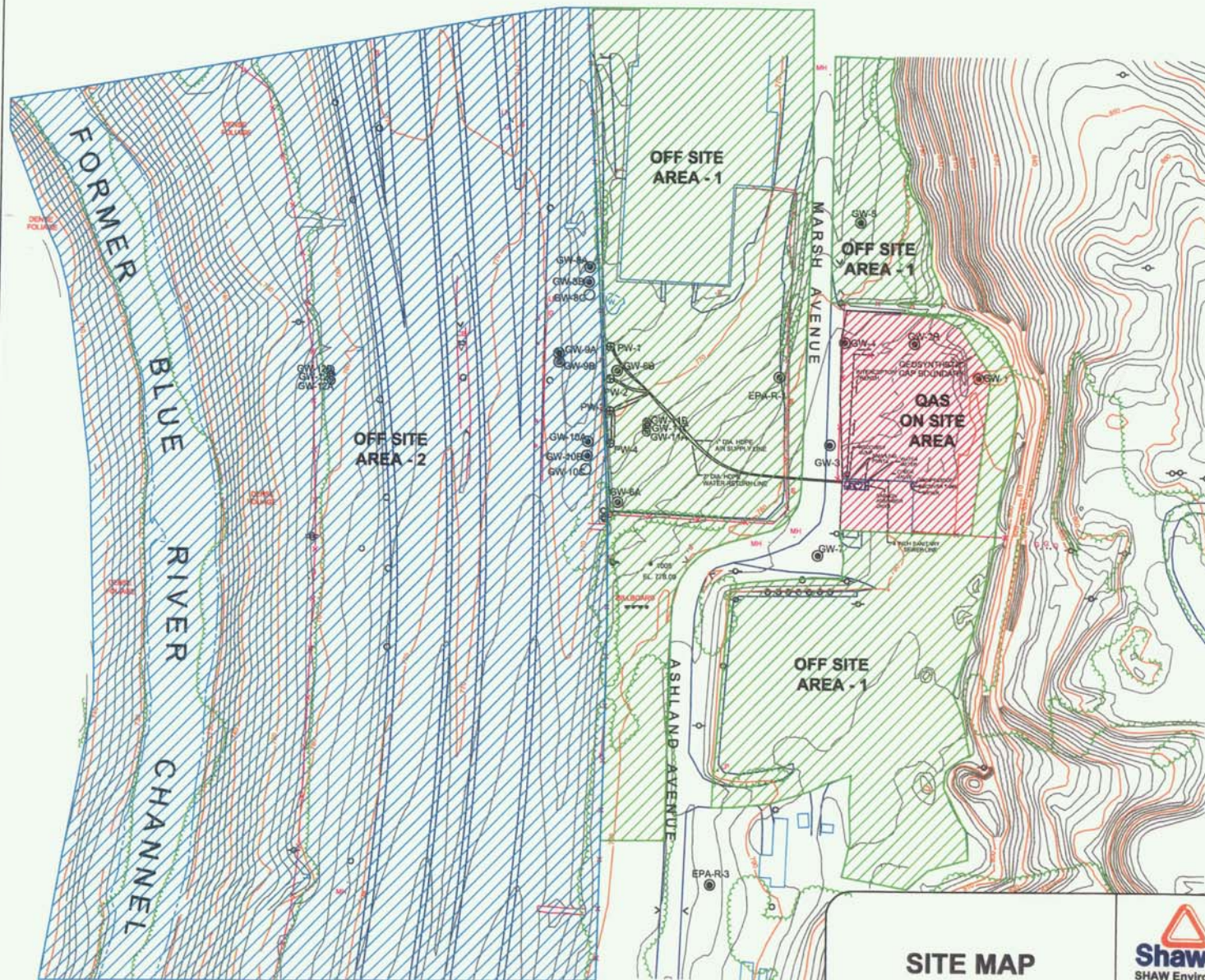


SITE LOCATION MAP

Shaw
SHAW Environmental, Inc.
4400 COLLEGE BLVD., SUITE 350
OVERLAND PARK, KANSAS 66211
(913) 451-1224

REV. NO.	0	DRAWING DATE:	02/14/06
DESIGNED BY:	PD	ACAD FILE:	
DRAWN BY:	TLR	PROJECT NO.	843875
CLIENT:	DEFFENBAUGH INDUSTRIES, INC.		
LOCATION:	BLUE SUMMIT, MISSOURI		

FIGURE: 1



LEGEND

- ⊕ EXTRACTION WELLS
- ⊙ MONITOR WELLS
- PROPOSED MONITOR WELLS



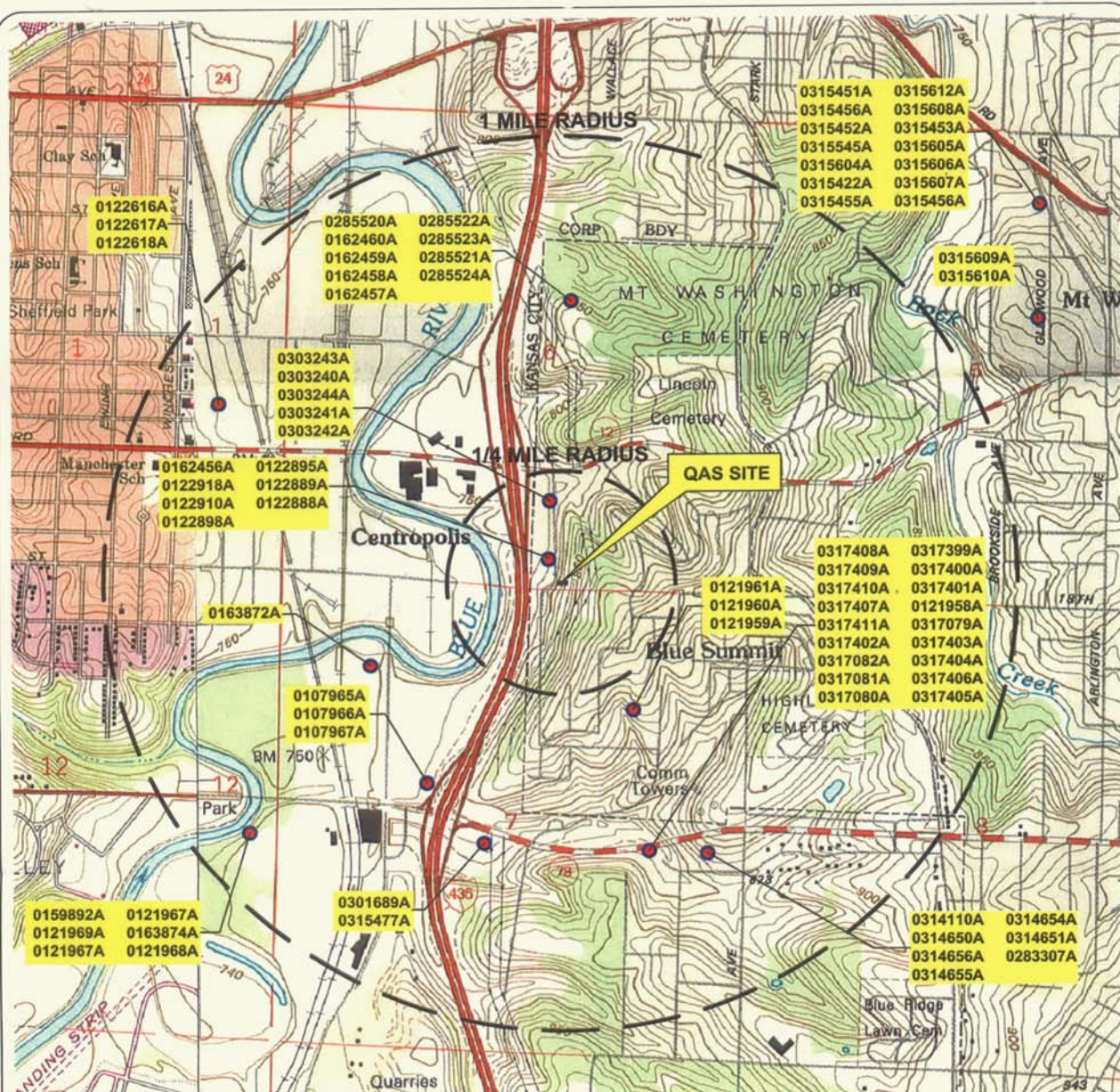
CONTOUR INTERVAL: 2'
DATE OF PHOTOGRAPHY: AUGUST 24, 1964

SITE MAP



4400 COLLEGE BLVD., SUITE 350
OVERLAND PARK, KANSAS 66211
(913) 451-1224

REV. NO.	1	DRAWING DATE:	01/12/05
DESIGNED BY:	JMC	ACAD FILE:	
DRAWN BY:	JMC	PROJECT NO.	843876
CLIENT:	DEFFENBAUGH INDUSTRIES, INC		
LOCATION:	BLUE SUMMIT, MISSOURI		
FIGURE:		2	



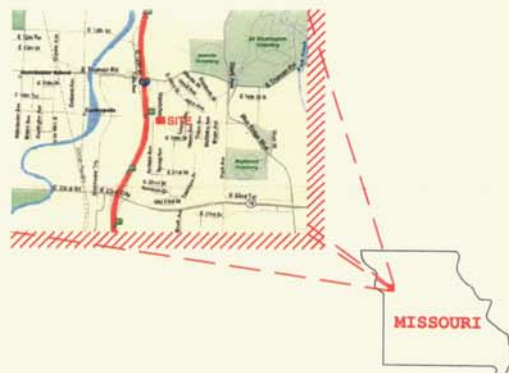
Taken from the
**INDEPENDENCE, MO
 and
 KANSAS CITY, MO - KANS.**

7.5 Series U.S.G.S. Topographic Quadrangle
 39094-A4-TF-024
 1990
 DMA 7162 III SW - SERIES V879



LEGEND

- MONITORING WELLS
- DRINKING WATER WELLS
(NONE WITHIN SITE AREA)



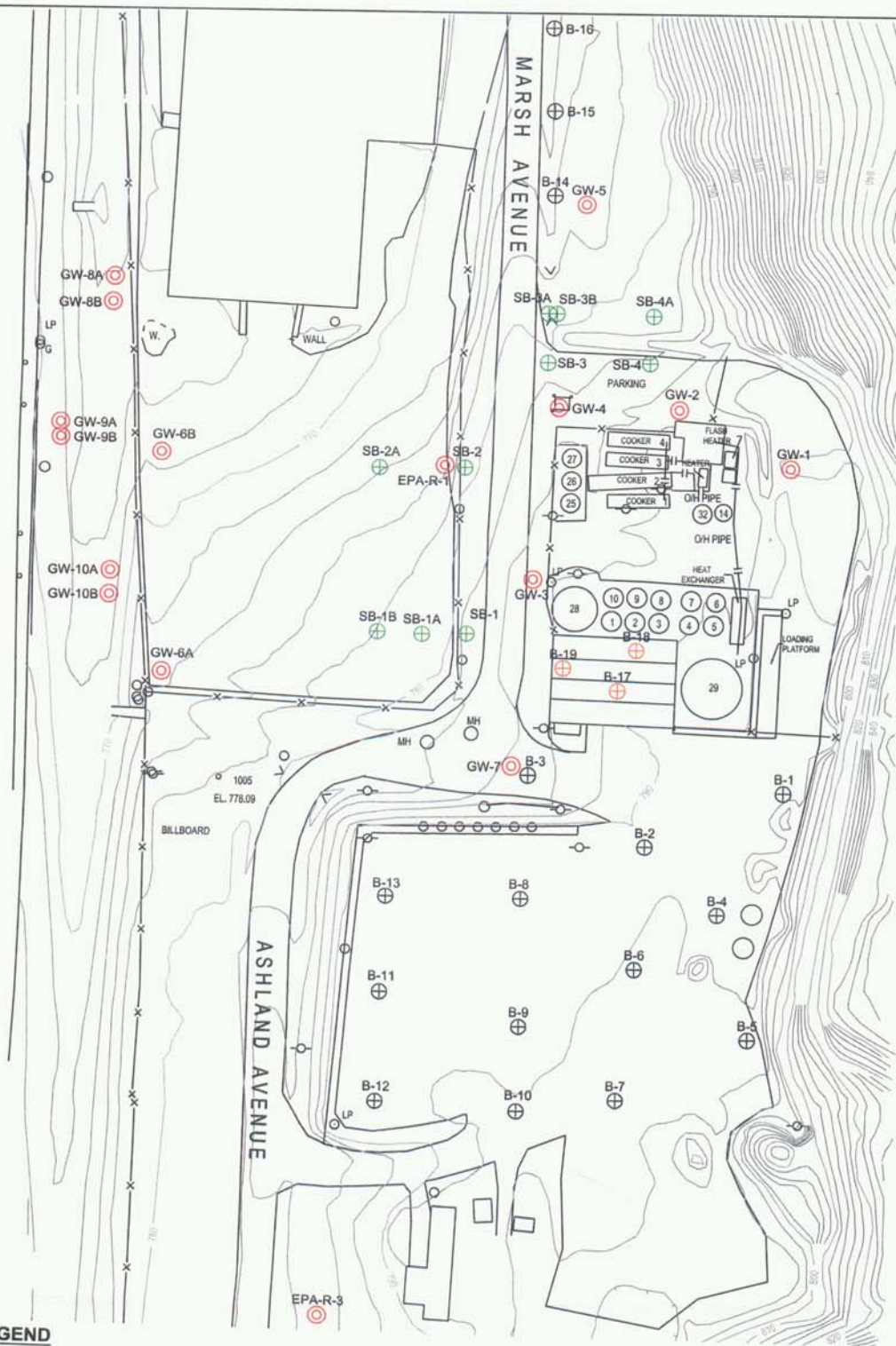
APPROXIMATE SCALE IN FEET



**WATER WELL SEARCH
 MAP**



REV. NO.	0	DRAWING DATE:	11/02/05
DESIGNED BY:	PD	ACAD FILE:	
DRAWN BY:	TLR	PROJECT NO.	843876
CLIENT:	DEFFENBAUGH INDUSTRIES, INC.		
LOCATION:	BLUE SUMMIT, MISSOURI		
FIGURE:	3		





APPENDIX
A



APPENDIX A

Water Well Records Search

Shaw Environmental, Inc.

4400 College Blvd, Suite 350
Overland Park, KS 66211-2326
913.451.1224
Fax: 913.451.2005



August 15, 2005

Sharon Beistel
Missouri Department of Natural Resources
Water Section
P.O. Box 176
Jefferson City, MO 65102-0176

RE: Well Use Search Data in Support of the Quality Analytical Services (QAS) Site Kansas City,
Missouri Human Health and Environment Risk Assessment

Dear Ms. Beistel:

Shaw E&I has been retained by Deffenbaugh Industries to perform a Human Health Risk Assessment and Environmental Assessment of the Quality Analytical Services site in Kansas City, MO. We have been working with Darlene Groner of MDNR on completing this evaluation. In support of planned HHRA activities we are required to perform a well use search within prescribed distances from the site. These distances are a 1-mile radius search for public water supply wells and a ¼ mile search radius for private wells from the QAS site. The location of the site is described as:

Quality Analytical Services

1633 Marsh Ave

Blue Summit, MO 64126

Latitude 39.09163 Longitude 94.48698

The site is located in the USGS 1:24,000 Independence, MO Quadrangle.

If you have any questions please contact me at 913-317-2631.

Sincerely,

Philip Dula, PG, CHMM

Senior Project Manager

Shaw E&I

[Send To Printer](#)

[Back To TerraServer](#)

[Change to 11x17 Print Size](#)

[Show Grid Lines](#)

[Change to Landscape](#)

USGS Kansas City, Missouri, United States 06 Mar 1997



0 1Km

0 1.5Mi

Image courtesy of the U.S. Geological Survey

© 2004 Microsoft Corporation.

[Terms of Use](#)

[Privacy Statement](#)

Missouri Department of NATURAL RESOURCES

FAX Transmittal Cover Sheet

DATE: August 17, 2005

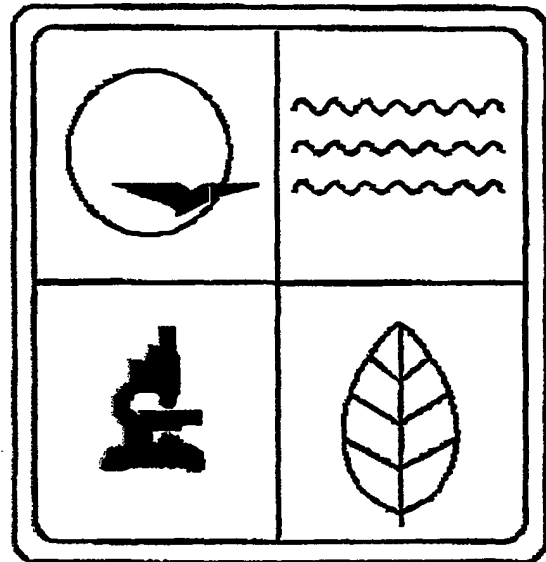
TO: PHILIP DULA

CO.: SHAW ENV
DEPT:

PHONE: (913) 451-1224

FAX #: (913) 317-2660

FROM: Sharon Beistel
Wellhead Protection Section
Geological Survey and Resource Assessment Division
Missouri Department of Natural Resources
P.O. Box 250, Rolla, MO 65402
sharon.beistel@dnr.mo.gov



RECYCLED PAPER

PHONE: 573-368-2168

FAX: 573-368-2317

RE: Water Well Search Request

COMMENTS:

WELL SEARCH FOR 39.09163N 94.48698W OR T49N R32W SEC 06 - 1 MILE RADIUS
ONLY MONITORING WELLS FOUND

Total number of pages sent was 9 (including this cover sheet). If not all pages are received, or if problems are experienced, please call: Sharon @ 573/ 368-2168

REFNUM	TYPE	STADDRESS	BUSINESS N
0315453A	M		INDEPENDENCE GAS &
0315605A	M	9300 INDEPENDENCE AVE IND	INDEPENDENCE GAS &
0315606A	M	9300 INDEPENDENCE AVE IND	INDEPENDENCE GAS &
0315607A	M	9300 INDEPENDENCE AVE IND	INDEPENDENCE GAS &
0315608A	M	9300 INDEPENDENCE AVE IND	INDEPENDENCE GAS &
0315609A	M	9300 INDEPENDENCE AVE IND	INDEPENDENCE GAS &
0315610A	M	9300 INDEPENDENCE AVE IND	INDEPENDENCE GAS &
0315612A	M	9300 INDEPENDENCE AVE IND	INDEPENDENCE GAS &
0315455A	m		INDEPENDENT GAS &
0315422A	M		INDEPENDENT GAS &
0315604A	M	9300 INDEPENDENCE AVE IND	INDEPENDENCE GAS &
0315454A	M		INDEPENDENCE GAS &
0315452A	M		INDEPENDENCE GAS &
0315451A	M		INDEPENDENCE GAS &
0315456A	M		INDEPENDENT GAS &
0285524A	M	940 W 8TH KC	PLANNED INDUSTRIAL
0122888A	M	1633 S MARSH, BLUE SUMMIT	INDUSTRIAL SERVICE
0122889A	M	1633 S MARSH, BLUE SUMMIT	INDUSTRIAL SERVICE
0122895A	M	KANSAS CITY	DEFFENBAUGH INDUS
0122898A	M	KANSAS CITY	DEFFENBAUGH INDUS
0122910A	M	KANSAS CITY	DEFFENBAUGH INDUS
0122918A	M	KANSAS CITY	DEFFENBAUGH INDUS
0162456A	M		
0303243A	M	8301 TRUMAN RD	CAMPBELL OIL CO
0303240A	M	8301 TRUMAN RD	CAMPBELL OIL CO
0285521A	M	940 W 8TH KC	PLANNED INDUSTRIAL
0285523A	M	940 W 8TH KC	PLANNED INDUST EXP
0285522A	M	940 W 8TH KC	PLANNED INDUSTRIAL
0162457A	M		
0162458A	M		
0162459A	M		
0162460A	M		
0303244A	M	8301 TRUMAN RD	CAMPBELL OIL CO

(b) (6)

CITY	USE	TOTA	DEPTH	Q 1	Q 2	Q 3	SEC	TWN	RNG	ELEV
INDEPENDENCE	M		20.3	NW	NW	NE	5	49	32	775
INDEPENDENCE	M		20	NW	NW	NE	5	49	32	775
INDEPENDENCE	M		25	NW	NW	NE	5	49	32	775
INDEPENDENCE	M		16	NW	NW	NE	5	49	32	775
INDEPENDENCE	M		20	NW	NW	NE	5	49	32	775
INDEPENDENCE	M		20	NW	NW	SE	5	49	32	775
INDEPENDENCE	M		20	NW	NW	SE	5	49	32	775
INDEPENDENCE	M		16	NW	NW	NE	5	49	32	775
INDEPENDENCE	M		16.3	NW	NW	NE	5	49	32	775
INDEPENDENCE	M		16.3	NW	NW	NE	5	49	32	775
INDEPENDENCE	M		20	NW	NW	NE	5	49	32	775
INDEPENDENCE	M		20.3	NW	NW	NE	5	49	32	775
INDEPENDENCE	M		20.3	NW	NW	NE	5	49	32	775
INDEPENDENCE	M		18.3	NW	NW	NE	5	49	32	775
INDEPENDENCE	M		16.3	NW	NW	NE	5	49	32	775
KANSAS CITY	M		40	SW	NW	NE	6	49	32	
SHAWNEE	M		15	SW	SW	SE	6	49	32	764
SHAWNEE	M		73	SW	SW	SE	6	49	32	764
SHAWNEE	M		24	SW	SW	SE	6	49	32	0
SHAWNEE	M		20	SW	SW	SE	6	49	32	0
SHAWNEE	M		76	SW	SW	SE	6	49	32	0
SHAWNEE	M		77	SW	SW	SE	6	49	32	0
INDEPENDENCE	M		19				6	49	32	0
KANSAS CITY	M		20.5	NW	SW	SE	6	49	32	775
KANSAS CITY	M		20.5	NW	SW	SE	6	49	32	775
KANSAS CITY	M		45	SW	NW	NE	6	49	32	
KANSAS CITY	M		45	SW	NW	NE	6	49	32	
KANSAS CITY	M		45	SW	NW	NE	6	49	32	
INDEPENDENCE	M		14				6	49	32	0
INDEPENDENCE	M		24				6	49	32	0
INDEPENDENCE	M		19				6	49	32	0
INDEPENDENCE	M		10				6	49	32	0
KANSAS CITY	M		20.5	NW	SW	SE	6	49	32	775

REFNUM	TYPE	SITEADDRESS	BUSINESS
0285520A	M	940 W 8TH KC	PLANNED INDUST EXP
0303241A	M	8301 TRUMAN RD	CAMPBELL OIL CO
0303242A	M	8301 TRUMAN RD	CAMPBELL OIL CO
0121959A	M	2300 OAKLAND,KANSAS CITY	KERR-MCGEE CHEMIC
0107985A	M	2201 MANCHESTER,KANSAS CI	LIBBY CORPORATION
0107986A	M	2201 MANCHESTER,KANSAS CI	LIBBY CORPORATION
0107987A	M	2201 MANCHESTER, KANSAS C	LIBBY CORPORATION
0317406A	M	700 SOUTH WEST BLVD	QUINN & QUINN
0317405A	M	700 SW BLVD	QUINN & QUINN
0317404A	M	700 SW BLVD	QUINN & QUINN
0317403A	M	700 SW BLVD	QUINN & QUINN
0317079A	M	700 SW BLVD KC	QUINN & QUINN
0121958A	M	2300 OAKLAND,KANSAS CITY	KERR-MCGEE CHEMIC
0163872A	M		HAVENS STEEL CO
0121960A	M	2300 OAKLAND,KANSAS CITY	KERR-MCGEE CHEMIC
0121961A	M	2300 OAKLAND,KANSAS CITY	KERR-MCGEE CHEMIC
0317401A	M	700 SW BLVD	QUINN & QUINN
0317400A	M	700 SW BLVD	QUINN & QUINN
0317399A	M	700 SW BLVD	QUINN & QUINN
0317080A	M	700 SW BLVD KC	QUINN & QUINN
0317081A	M	700 SW BLVD KC	QUINN & QUINN
0317082A	M	700 SW BLVD KC	QUINN & QUINN
0317402A	M	700 SW BLVD	QUINN & QUINN
0317411A	M	700 SOUTHWEST BLVF	QUINN & QUINN
0314656A	M	8301 TRUMAN RD KC MO	
0314655A	M	8301 TRUMAN RD KC MO	
0314654A	M	8301 TRUMAN RD KC MO	
0314651A	M	8301 TRUMAN RD KC MO	
0314650A	M	8301 TRUMAN RD KC MO	
0314110A	M	8301 TRUMAN RD KC MO	
0317410A	M	700 SOUTHWEST BLVF	QUINN & QUINN
0317409A	M	700 SOUTHWEST BLVF	QUINN & QUINN
0283307A	M	8301 TRUMAN RD	

(b) (6)

CITY	USE	TOTAL	BTH	Q 1	Q 2	Q 3	SEC	TWN	RNG	BLD
KANSAS CITY	M	44	SW	NW	NE		6	49	32	
KANSAS CITY	M	20.5	NW	SW	SE		6	49	32	775
KANSAS CITY	M	20.5	NW	SW	SE		6	49	32	775
OKLAHOMA CITY	M	42					7	49	32	754
KANSAS CITY	M	15	SW	SE	NW		7	49	32	0
KANSAS CITY	M	18	SW	SE	NW		7	49	32	0
KANSAS CITY	M	20	SW	SE	NW		7	49	32	0
KANSAS CITY	M	18.3	NW	NE	SE		7	49	32	225
KANSAS CITY	M	20.2	NW	NE	SE		7	49	32	225
KANSAS CITY	M	16.3	NW	NE	SE		7	49	32	225
KANSAS CITY	M	20.3	NW	NE	SE		7	49	32	225
KANSAS CITY	M	25.3	NW	NE	SE		7	49	32	220
OKLAHOMA CITY	M	59					7	49	32	751
KANSAS CITY	M	18		NW	NW		7	49	32	0
OKLAHOMA CITY	M	66					7	49	32	754
OKLAHOMA CITY	M	39					7	49	32	751
KANSAS CITY	M	20.3	NW	NE	SE		7	49	32	225
KANSAS CITY	M	25.2	NW	NE	SE		7	49	32	225
KANSAS CITY	M	20.3	NW	NE	SE		7	49	32	225
KANSAS CITY	M	22.5	NW	NE	SE		7	49	32	220
KANSAS CITY	M	25.3	NW	NE	SE		7	49	32	220
KANSAS CITY	M	20	NW	NE	SE		7	49	32	220
KANSAS CITY	M	22.3	NW	NE	SE		7	49	32	225
KANSAS CITY	M	25.2	NW	NE	SE		7	49	32	224
KANSAS CITY	M	20	NE	NE	SW		7	49	32	930
KANSAS CITY	M	20	NE	NE	SW		7	49	32	930
KANSAS CITY	M	20	NE	NE	SW		7	49	32	930
KANSAS CITY	M	16.3	NE	NE	SW		7	49	32	929
KANSAS CITY	M	19.3	NE	NE	SW		7	49	32	930
KANSAS CITY	M	23.3	NE	NE	SW		7	49	32	940
KANSAS CITY	M	25.2	NW	NE	SE		7	49	32	224
KANSAS CITY	M	25.3	NW	NE	SE		7	49	32	225
KANSAS CITY	M	20	NE	NE	SW		7	49	32	910

REFNUM	TYPE	SITEADDRESS	BUSINESS NAME	OWNER NAME
0317407A	M	700 SOUTH WEST BLVD	QUINN & QUINN	
0317408A	M	700 SOUTH WEST BLVD	QUINN & QUINN	
0301689A	M	8301 TRUMAN RD		
0315477A	M	8301 TRUMAN RD		
0122616A	M	5925 INDEPENDENCE AVE KC	AMERICAN STORES PR	
0122617A	M	5925 INDEPENDENCE AVE KC	AMERICAN STORES PR	
0122618A	M	5925 INDEPENDENCE AVE,KC	AMERICAN STORES PR	
0121968A	M	2300 OAKLAND,KANSAS CITY	KERR-MCGEE CHEMIC	
0163874A	M		HAVENS STEEL CO	
0121967A	M	2300 OAKLAND,KANSAS CITY	KERR-MCGEE CHEMIC	
0121966A	M	2300 OAKLAND,KANSAS CITY	KERR-MCGEE CHEMIC	
0121969A	M	2300 OAKLAND,KANSAS CITY	KERR-MCGEE CHEMIC	
0159892A	M		KERR MCGEE	
0206578A	M	7000 WINNER RD 33MW135	ARMCO	
0022988A	M	8501 WINNER RD KANSAS CITY	QUICK TRIP CORP	
0115528A	M	308 N HWY 291,INDEPENDENC	FINA OIL & CHEMICAL	
0023002A	M	8501 WINNER RD KANSAS CITY	QUICKTRIP CORPORATI	
0022989A	M	8501 WINNER RD KANSAS CITY	QUICK TRIP CORP	
0115529A	M	208 N291 HWY, INDEPENDENC	FINA OIL & CHEMICAL	
0115530A	M	308 N 291 HWY,INDEPENDENC	FINA OIL & CHEMICAL	
0022990A	M	8501 WINNER RD KANSAS CITY	QUICK TRIP CORP	
0022991A	M	8501 WINNER RD KANSAS CITY	QUICK TRIP CORP	
0022987A	M	8501 WINNER RD KANSAS CITY	QUICK TRIP CORP	
0206579A	M		ARMCO	
0206576A	M	7000 WINNER RD 33MW125	ARMCO INC	
0206577A	M		ARMCO INC	
0121987A	M	7000 ROBERTS ST,KANSAS CIT	ARMCO,INC. (MW-3A)	
0163490A	M	7000 WINNER RD,KC	ARMCO	
0163489A	M	7000 WINNER RD,KC	ARMCO	
0163488A	M		ARMCO	
0161832A	M	8501 WINNER RD,KC	QUICKTRIP CORPORATI	
0160198A	M	8501 WINNER RD KANSAS CITY	QUICKTRIP CORPORATI	
0160197A	M	8501 WINNER RD KANSAS CITY	QUICKTRIP CORPORATI	

(b) (6)

CITY	USE	TOTAL	DEPTH	Q1	Q2	Q3	SEC	TWN	RNG	ELEV
KANSAS CITY	M	23.3	NW NE SE	7	49	32				225
KANSAS CITY	M	25.2	NW NE SE	7	49	32				225
KANSAS CITY	M	20	NE NE SW	7	49	32				910
KANSAS CITY	M	20	NE NE SW	7	49	32				910
SALT LAKE CITY	M	20		1	49	33				0
SALT LAKE CITY	M	20		1	49	33				0
SALT LAKE CITY	M	20		1	49	33				0
OKLAHOMA CITY	M	25	NE NE SE	12	49	33				740
KANSAS CITY	M	18		12	49	33				0
OKLAHOMA CITY	M	49	NE NE SE	12	49	33				739
OKLAHOMA CITY	M	25	NE NE SE	12	49	33				750
OKLAHOMA CITY	M	49	NE NE SE	12	49	33				744
OKLAHOMA CITY	M	62		12	49	33				0
KANSAS CITY	M	18		31	50	32				0
TULSA	M	16	NE SW SE	31	50	32				
DALLAS	M	18		31	50	32				950
TULSA	M	16.5	NE SW SE	31	50	32				840
TULSA	M	16.5	NE SW SE	31	50	32				
DALLAS	M	15		31	50	32				950
DALLAS	M	15		31	50	32				950
TULSA	M	16.5	SE SE SE	31	50	32				
TULSA	M	15	SE SE SE	31	50	32				
TULSA	M	16.5	NE SW SE	31	50	32				
KANSAS CITY	M	69	NW SW SW	31	50	32				0
KANSAS CITY	M	18		31	50	32				0
KANSAS CITY	M	69	NW SW SW	31	50	32				0
KANSAS CITY	M	40	NW NW NE	31	50	32				0
KANSAS CITY	M	18		31	50	32				0
KANSAS CITY	M	18		31	50	32				0
KANSAS CITY	M	0		31	50	32				0
TULSA	M	15		31	50	32				0
TULSA	M	22	NE SW SE	31	50	32				840
TULSA	M	20	NE SW SE	31	50	32				840

REFERENCE	TYPE	ADDRESS	BUSINESS
0160198A	M	8501 WINNER RD KANSAS CITY	QUIKTRIP CORPORATI
0160195A	M	8501 WINNER RD KANSAS CITY	QUIKTRIP CORPORATI
0163487A	M		ARMCO
0160194A	M	8501 WINNER RD KANSAS CITY	QUIKTRIP CORPORATI
0116554A	H		
0315603A	M	9300 INDEPENDENCE AVE IND	INDEPENDENCE GAS &
0315602A	M	9300 INDEPENDENCE AVE IND	INDEPENDENCE GAS &
0103730A	M	7000 WINNER RD	ARMCO
0106486A	M	VAN BRUNT & INDEP, INDEPEN	AMOCO OIL CO.
0303106A	M	4722 INDEPENDENCE AVE, KC	BP PRODUCTS NORTH
0303104A	M	4722 INDEPENDENCE AVE, KC	BP PRODUCTS NORTH
0106488A	M	VAN BRUNT & INDEP, INDEPEN	AMOCO OIL CO.
0106485A	M	VAN BRUNT & INDEP, INDEPEN	AMOCO OIL COMPANY
0106487A	M	VAN BRUNT & INDEP, INDEPEN	AMOCO OIL CO.
0106482A	M	VAN BRUNT & INDEP, INDEPEN	AMOCO OIL COMPANY

(b) (6)

CITY	USE	TOTAL	DEPTH	Q1	Q2	Q3	SEC	TWN	RNG	ELEV
TULSA	M		19	NE	SW	SE	31	50	32	840
TULSA	M		22	NE	SW	SE	31	50	32	840
KANSAS CITY	M		0			SW	31	50	32	0
TULSA	M		19	NE	SW	SE	31	50	32	840
INDEPENDENCE			190				32	50	32	
INDEPENDENCE	M		20	SW	SW	SE	32	50	32	775
INDEPENDENCE	M		18	SW	SW	SE	32	50	32	775
KANSAS CITY	M		65			NW	32	50	32	0
LENEXA	M		25		SE	SW	35	50	33	0
ST CHARLES	M		27	SW	SE	SW	35	50	33	
ST CHARLES	M		26	SW	SE	SW	35	50	33	
LENEXA	M		25		SE	SW	35	50	33	0
LENEXA	M		25		SE	SW	35	50	33	0
LENEXA	M		25		SE	SW	35	50	33	0
LENEXA	M		25		SE	SW	35	50	33	0

APPENDIX
B

APPENDIX B

Soil Data Summary Tables

TABLE B-1
SUMMARY OF DETECTED VOLATILE ORGANIC COMPOUNDS IN SOILS
QUALITY ANALYTICAL SERVICES SITE
BLUE SUMMIT, MO

BORING	DEPTH	SAMPLE DATE	Units	Acetone	Chloromethane	Methylene Chloride	1,1,2,2-Tetra-chloroethane	Xylenes	Toluene
97B1	4"	13-Oct-97	mg/kg	0.50 U	0.05 U	0.05 U	15.30	0.0625 U	0.0625 U
97B6	10'	20-Oct-97	mg/kg	0.50 U	66.90 J	0.05 U	0.0125 U	0.0625 U	0.0625 U
97B8	25'	22-Oct-97	mg/kg	0.50 U	0.05 U	78.40	0.0125 U	0.0625 U	0.0625 U
97B8	29'	22-Oct-97	mg/kg	0.50 U	0.05 U	0.05 U	17.90	0.0625 U	0.0625 U
97B13	6"	11-Nov-97	mg/kg	0.50 U	0.05 U	0.05 U	0.0125 U	0.0625 U	68.50
97B13	DUP	11-Nov-97	mg/kg	0.50 U	0.05 U	0.05 U	0.0125 U	0.0625 U	96.00
97B14	6"	24-Nov-97	mg/kg	0.50 U	0.05 U	60.50	0.0125 U	0.0625 U	0.0625 U
97B14	5'	24-Nov-97	mg/kg	0.50 U	0.05 U	76.30	0.0125 U	0.0625 U	0.0625 U
97B14	10'	24-Nov-97	mg/kg	0.50 U	0.05 U	83.50	0.0125 U	0.0625 U	0.0625 U
97B14	11'	24-Nov-97	mg/kg	0.50 U	0.05 U	74.10	0.0125 U	0.0625 U	0.0625 U
97B14	15'	24-Nov-97	mg/kg	0.50 U	0.05 U	109.0	0.0125 U	0.0625 U	0.0625 U
97B14	20'	24-Nov-97	mg/kg	0.50 U	0.05 U	113.0	0.0125 U	0.0625 U	0.0625 U
97B14	24'	24-Nov-97	mg/kg	0.50 U	0.05 U	77.40	0.0125 U	0.0625 U	0.0625 U
97B15	6"	25-Nov-97	mg/kg	0.50 U	0.05 U	73.40	0.0125 U	0.0625 U	0.0625 U
97B15	5'	25-Nov-97	mg/kg	0.50 U	0.05 U	95.50	0.0125 U	0.0625 U	0.0625 U
97B15	10'	25-Nov-97	mg/kg	0.50 U	0.05 U	111.0	0.0125 U	0.0625 U	0.0625 U
97B15	DUP	25-Nov-97	mg/kg	0.50 U	0.05 U	87.50	0.0125 U	0.0625 U	0.0625 U
97B16	6"	26-Nov-97	mg/kg	0.50 U	0.05 U	74.40	0.0125 U	0.0625 U	0.0625 U
97B16	5'	26-Nov-97	mg/kg	1070	0.05 U	78.10	0.0125 U	0.0625 U	0.0625 U
97B16	10'	26-Nov-97	mg/kg	0.5 U	0.05 U	63.60	0.0125 U	0.0625 U	0.0625 U
97B16	22'	26-Nov-97	mg/kg	876	0.05 U	0.05 U	0.0125 U	0.0625 U	0.0625 U
98B18	7.5'	11-Mar-98	mg/kg	0.50 U	0.05 U	0.05 U	0.0125 U	0.2400	0.0625 U
98B19	15.0'	11-Mar-98	mg/kg	0.50 U	0.05 U	0.05 U	0.0191	0.0625 U	0.0625 U

Definitions:

mg/kg = Milligrams per kilogram

J = Value is estimated

U = Undetected at method detection limit

B18: Shaded borings located inside building.

Only locations with detections are included in the summary table. All other locations were non-detect.

TABLE 2
ANALYTICAL RESULTS
BORINGS BENEATH THE ON-SITE BUILDING

CHEMICAL	Date Collected	Units	B17R - 0.5'	B17R - 2.5'	B17R - 5.0'	B17R - 7.5'	B18R - 0.5'	B18R - 2.5'	B19R - 0.5'	B19R - 2.5'	B19R - 5.0'	B19R - 7.5'	B19R - 10.0'	B19R - 12.5'
SEMI-VOLATILE ORGANIC COMPOUNDS														
Acenaphthene	25-Aug-00	ug/kg	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
Anthracene	25-Aug-00	ug/kg	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
Benzoic acid	25-Aug-00	ug/kg	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
Benzo(a)anthracene	25-Aug-00	ug/kg	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
Bis(2-ethylhexyl)phthalate	25-Aug-00	ug/kg	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
Chrysene	25-Aug-00	ug/kg	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
2,4-Dimethylphenol	25-Aug-00	ug/kg	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
Dibenzofuran	25-Aug-00	ug/kg	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
1,2-Dichlorobenzene	25-Aug-00	ug/kg	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
1,4-Dichlorobenzene	25-Aug-00	ug/kg	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
2,4-Dinitrotoluene	25-Aug-00	ug/kg	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
Hexachlorobenzene	25-Aug-00	ug/kg	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
Hexachloroethane	25-Aug-00	ug/kg	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
Hexachlorobutadiene	25-Aug-00	ug/kg	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
Fluoranthene	25-Aug-00	ug/kg	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
Fluorene	25-Aug-00	ug/kg	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
2-Methylnaphthalene	25-Aug-00	ug/kg	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
2-Methylphenol	25-Aug-00	ug/kg	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
Nitrobenzene	25-Aug-00	ug/kg	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
Naphthalene	25-Aug-00	ug/kg	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
3-Methylphenol	25-Aug-00	ug/kg	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
Butyl benzyl phthalate	25-Aug-00	ug/kg	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
p-Cresol (4-methylphenol)	25-Aug-00	ug/kg	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
Pyradine	25-Aug-00	ug/kg	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
Di-n-butylphthalate	25-Aug-00	ug/kg	ND	ND	54(J)	ND	ND	60(B,J)	ND	ND	ND	100(B,J)	42(B,J)	ND
N-Nitrosodiphenylamine	25-Aug-00	ug/kg	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
Phenanthrene	25-Aug-00	ug/kg	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
Phenol	25-Aug-00	ug/kg	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
Pyrene	25-Aug-00	ug/kg	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
PESTICIDES														
beta-BHC	25-Aug-00	ug/kg	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
gamma-BHC	25-Aug-00	ug/kg	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
Heptachlor	25-Aug-00	ug/kg	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
Heptachlor epoxide	25-Aug-00	ug/kg	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
METALS														
Hexavalent Chrome	25-Aug-00	mg/kg	0.258	0.203	0.641	1.02	0.367	0.137	0.418	0.299	0.465	0.685	0.47	0.718

(B)-Analyte is found in the associated blank

(J)-Detected but below the PRL; result is estimated

TAB. 2
ANALYTICAL RESULTS
BORINGS BENEATH THE ON-SITE BUILDING

CHEMICAL	Date Collected	Units	B19R - 15.0'	B19R - 17.5'	B19R - 20.0'	DUPLICATE
SEMI-VOLATILE ORGANIC COMPOUNDS						
Acenaphthene	25-Aug-00	ug/kg	ND	ND	ND	ND
Anthracene	25-Aug-00	ug/kg	62(J)	ND	ND	ND
Benzoic acid	25-Aug-00	ug/kg	ND	ND	ND	ND
Benzo(a)anthracene	25-Aug-00	ug/kg	ND	ND	ND	ND
Bis(2-ethylhexyl)phthalate	25-Aug-00	ug/kg	210(J)	ND	ND	ND
Chrysene	25-Aug-00	ug/kg	ND	ND	ND	ND
2,4-Dimethylphenol	25-Aug-00	ug/kg	ND	ND	ND	ND
Dibenzofuran	25-Aug-00	ug/kg	ND	ND	ND	ND
1,2-Dichlorobenzene	25-Aug-00	ug/kg	ND	ND	ND	ND
1,4-Dichlorobenzene	25-Aug-00	ug/kg	ND	ND	ND	ND
2,4-Dinitrotoluene	25-Aug-00	ug/kg	ND	ND	ND	ND
Hexachlorobenzene	25-Aug-00	ug/kg	ND	ND	ND	ND
Hexachloroethane	25-Aug-00	ug/kg	ND	ND	ND	ND
Hexachlorobutadiene	25-Aug-00	ug/kg	ND	ND	ND	ND
Fluoranthene	25-Aug-00	ug/kg	ND	ND	ND	ND
Fluorene	25-Aug-00	ug/kg	ND	ND	ND	ND
2-Methylnaphthalene	25-Aug-00	ug/kg	ND	ND	ND	ND
2-Methylphenol	25-Aug-00	ug/kg	ND	ND	ND	ND
Nitrobenzene	25-Aug-00	ug/kg	ND	ND	ND	ND
Naphthalene	25-Aug-00	ug/kg	ND	ND	ND	ND
3-Methylphenol	25-Aug-00	ug/kg	ND	ND	ND	ND
Butyl benzyl phthalate	25-Aug-00	ug/kg	ND	ND	ND	ND
p-Cresol (4-methylphenol)	25-Aug-00	ug/kg	ND	ND	ND	ND
Pyridine	25-Aug-00	ug/kg	ND	ND	ND	ND
Di-n-butylphthalate	25-Aug-00	ug/kg	140(B,J)	90(B,J)	89(B,J)	ND
N-Nitrosodiphenylamine	25-Aug-00	ug/kg	ND	ND	ND	ND
Phenanthrene	25-Aug-00	ug/kg	ND	ND	ND	ND
Phenol	25-Aug-00	ug/kg	ND	ND	ND	ND
Pyrene	25-Aug-00	ug/kg	ND	ND	ND	ND
PESTICIDES						
beta-BHC	25-Aug-00	ug/kg	ND	ND	2.8	ND
gamma-BHC	25-Aug-00	ug/kg	ND	ND	ND	ND
Heptachlor	25-Aug-00	ug/kg	ND	ND	ND	ND
Heptachlor epoxide	25-Aug-00	ug/kg	ND	ND	ND	ND
METALS						
Hexavalent Chrome	25-Aug-00	mg/kg	0.816	1.42	1.12	0.581

(B)-Analyte is found in the associated blank

(J)-Detected but below the PRL; result is estimated

TABLE B-3
SUMMARY OF DETECTED PESTICIDES AND PCBs IN SOILS
QUALITY ANALYTICAL SERVICES SITE
BLUE SUMMIT, MO

BORING	DEPTH	DATE SAMPLED	CONCENTRATIONS IN mg/kKg		
			beta-BHC	Heptachlor	PCB-1260
97B3	3"	14-Nov-97	0.002 U	0.002 U	0.0790
97B4	3"	20-Oct-97	0.002 U	0.0549	0.002 U
97B5	6"	20-Oct-97	0.002 U	0.0076	0.0987
97B7	4"	21-Oct-97	0.002 U	0.0096	0.0610
	15'	21-Oct-97	0.002 U	0.002 U	0.0278
97B8	5'	21-Oct-97	0.002 U	0.00670	0.002 U
	29'	22-Oct-97	0.002 U	0.00879 J	0.0400
97B9	2"	3-Nov-97	0.002 U	0.002 U	0.0470
	5'	3-Nov-97	0.002 U	0.002 U	0.0173
	10'	3-Nov-97	0.002 U	0.002 U	0.0109
97B10	6"	4-Nov-97	0.002 U	0.002 U	0.0360
	25'	4-Nov-97	0.002 U	0.002 U	0.0124
97B11	6"	5-Nov-97	0.002 U	0.002 U	0.0128
97B12	6"	10-Nov-97	0.002 U	0.002 U	0.0458
	20'	10-Nov-97	0.002 U	0.00285	0.002 U
97B14	10'	24-Nov-97	0.002 U	0.0150 J	0.0357
	11'	24-Nov-97	0.002 U	0.00917 J	0.0687
	20'	24-Nov-97	0.002 U	0.00497 J	0.002 U
97B16	6"	26-Nov-97	0.00881	0.002 U	0.002 U
98B18	7.5'	11-Mar-98	0.004	0.007	0.4450
98B19	0'	11-Mar-98	0.002 U	0.002 U	0.0428
	12.5'	11-Mar-98	0.002 U	0.002 U	0.0730
	15.0'	11-Mar-98	0.002 U	0.002 U	0.0270
	16.8'	11-Mar-98	0.002 U	0.002 U	0.0840

J = VALUES ARE ESTIMATED

B18: Shaded borings located inside building.

Only locations with detections are included in the summary table. All other locations were non-detect.

T 4
SUMMARY OF DETECTED METALS IN SOILS
QUALITY ANALYTICAL SERVICES SITE
BLUE SUMMIT, MO

SAMPLE ID	SAMPLE DATE	UNITS	ARSENIC	BARIUM	BERYLLIUM	CADMIUM	CHROMIUM	COBALT	COPPER	IRON	LEAD	MANGANESE	MERCURY	NICKEL	SILVER	THALLIUM	TIN	VANADIUM	ZINC
97B1-4"	13-Oct-97	mg/Kg	5.0 U	74.6	0.1990	0.929	5.82	1.50 J	6.67 J	4,420	6.37	229	0.075 U	7.10	2,900	0.185 U	2.5 U	10.30	17.70 J
97B2-4"	13-Oct-97	mg/Kg	5.0 U	94.5	0.4430	1.66	10.30	3.24 J	9.53 J	8,620	14.70	415	0.075 U	12.60	2,450	0.185 U	2.5 U	16.90	36.70 J
97B2-2.5'	13-Oct-97	mg/Kg	6.98	175.0	0.9030	2.993	13.40	7.70 J	13.50 J	18,600	16.30	799	0.090	20.20	0.326	0.215	2.5 U	17.10	52.00 J
97B2-7.5'	13-Oct-97	mg/Kg	5.0 U	98.1	0.6150	2.19	12.80	5.63 J	12.20 J	14,100	12.00	351	0.075 U	15.10	0.310	0.185 U	2.5 U	18.10	56.60 J
97B2-10.0'	13-Oct-97	mg/Kg	15.40	107.0	1.120	4.59	23.40	12.10 J	20.30 J	20,400	20.40	439	0.075 U	46.10	0.287	0.395	2.5 U	12.40	195.00 J
97B3-3"	14-Oct-97	mg/Kg	5.0 U	45.5	0.2230 J	0.775	5.57	1.82 J	6.92	5,100	20.10	335 J	ND(0.75) UR	6.96	2.5 U	0.185 U	2.5 U	10.40	29.70 J
97B3-2.5'	14-Oct-97	mg/Kg	6.04	122.0	0.8780 J	2.15	12.70	7.29 J	11.90	14,200	13.90	553 J	ND(0.75) UR	16.50	2.5 U	0.185 U	2.5 U	22.60	40.90 J
97B3-5.0'	14-Oct-97	mg/Kg	6.07	118.0	0.8380 J	1.78	10.50	7.27 J	11.10	14,100	14.60	597 J	0.4070 R	16.00	2.5 U	0.185 U	2.5 U	18.30	39.60 J
97B3-7.0'	14-Oct-97	mg/Kg	5.0 U	139.0	0.6950 J	1.85	10.70	6.83 J	12.40	13,800	16.00	634 J	0.4020 R	14.80	2.5 U	0.185 U	2.5 U	16.80	41.30 J
97B3-10.0'	14-Oct-97	mg/Kg	7.91	174.0	0.7450 J	2.05	11.80	7.36 J	12.40	17,100	14.40	605 J	0.4140 R	14.50	2.5 U	0.185 U	2.5 U	20.20	47.40 J
97B3-12.0'	14-Oct-97	mg/Kg	7.13	118.0	0.6930 J	1.96	9.91	6.71 J	11.80	14,600	13.70	499 J	ND(0.75) UR	16.70	2.5 U	0.185 U	2.5 U	17.10	45.30 J
97B3-15.0'	14-Oct-97	mg/Kg	7.43	144.0	0.7092 J	1.98	9.78	7.28 J	13.20	15,600	14.50	507 J	0.7060 R	17.80	2.5 U	0.211	2.5 U	18.90	51.10 J
97B3-17.5'	14-Oct-97	mg/Kg	6.45	178.0	0.6900 J	2.00	10.30	6.53 J	13.80	13,800	14.10	743 J	ND(0.75) UR	18.00	2.5 U	0.216	2.5 U	17.40	51.10 J
97B3-20.0'	14-Oct-97	mg/Kg	6.34	197.0	0.6500 J	2.15	9.69	7.74 J	13.40	13,000	14.00	1,150 J	ND(0.75) UR	21.80	2.5 U	0.212	2.5 U	16.30	50.50 J
DUPLICATE	14-Oct-97	mg/Kg	5.10	150.0	0.6990 J	1.83	10.80	7.49 J	12.00	13,100	13.70	641 J	0.087	14.10	2.5 U	0.185 U	2.5 U	20.10	43.70 J
97B4-3"	20-Oct-97	mg/Kg	5.0 U	41.7	0.1950	1.09	6.39	1.71 J	10.40	5,120	42.60	251 J	0.075 U	6.62 J	2.5 U	0.185 U	2.5 U	4.28	85.40 J
97B5-6"	20-Oct-97	mg/Kg	5.0 U	146.0	0.3950	1.32	8.88	4.76 J	11.90	7,820	43.40	515 J	0.075 U	13.80 J	2.5 U	0.185 U	2.5 U	9.64	54.60 J
97B6-4"	20-Oct-97	mg/Kg	5.0 U	49.8	0.2850	0.801	7.26	2.44 J	7.19	5,610	12.20	257 J	0.075 U	8.46 J	2.5 U	0.185 U	2.5 U	8.32	27.80 J
97B6-10.0'	20-Oct-97	mg/Kg	16.20	91.4	0.9880	5.23	68.30	8.98 J	58.10	16,800	68.40	208 J	0.178	54.80 J	2.5 U	0.982	2.5 U	389.0	5.34 J
97B7-4"	21-Oct-97	mg/Kg	5.0 U	60.5	0.3150	1.37	7.29	2.85	7.16 J	6,390	26.30	363 J	0.075 U	9.58	2.5 U	0.185 U	2.5 U	9.54	31.80 J
97B7-10.0'	21-Oct-97	mg/Kg	5.51	164.0	0.6910	2.30	10.70	6.90	12.10 J	13,900	14.70	681 J	0.075 U	15.50	2.5 U	0.185 U	2.5 U	18.30	47.60 J
97B8-6"	21-Oct-97	mg/Kg	5.0 U	110.0	0.2500	1.24	7.00	2.00	8.94 J	5,270	15.40	321 J	0.075 U	8.09	2.5 U	0.185 U	2.5 U	7.19	39.70 J
97B8-5"	21-Oct-97	mg/Kg	5.0 U	132.0	0.8870	2.77	16.80	8.48	14.30 J	16,600	18.70	699 J	0.075 U	20.40	2.5 U	0.219	2.5 U	20.10	49.10 J
97B8-10'	21-Oct-97	mg/Kg	5.0 U	166.0	0.8020	2.64	13.50	8.31	13.20 J	15,000	16.70	707 J	0.075 U	20.50	2.5 U	0.185 U	2.5 U	19.40	49.10 J
97B8-15'	21-Oct-97	mg/Kg	5.56	141.0	0.9130	2.78	15.50	8.33	15.00 J	16,500	18.10	803 J	0.075 U	21.20	2.5 U	0.234	2.5 U	22.30	61.40 J
97B8-20'	21-Oct-97	mg/Kg	10.10	251.0	1.0500	3.75	21.20	11.30	21.10 J	23,700	18.20	599 J	0.075 U	28.30	2.5 U	0.185 U	2.5 U	30.50	67.80 J
97B8-25'	22-Oct-97	mg/Kg	5.0 U	75.3	0.6230	1.26	11.80	5.42 J	11.10	9,830	12.30	66	0.075 U	10.20	2.5 U	0.185 U	2.5 U	13.70 J	52.90
97B8-29'	22-Oct-97	mg/Kg	5.0 U	115.0	0.6210	1.80	10.90	5.51 J	10.80	11,500	13.00	219	0.075 U	14.70	2.5 U	0.185 U	2.5 U	16.80 J	64.70
97B9-2"	3-Nov-97	mg/Kg	5.0 U	63.4	U	1.53 J	6.85	3.41	7.89	7,120	13.10	408	0.075 U	9.20 J	2.5 U	0.185 U	2.5 U	7.48	33.50 J
97B9-5"	3-Nov-97	mg/Kg	5.72	186.0	0.9630	2.92 J	18.10	8.38	13.40	15,600	18.40	657	0.075 U	21.40 J	2.5 U	0.185 U	2.5 U	23.70	46.10 J
97B9-10.0'	3-Nov-97	mg/Kg	5.25	143.0	0.8430	2.55 J	13.20	8.33	12.50	14,900	17.00	715	0.075 U	20.70 J	2.5 U	0.185 U	2.5 U	19.00	54.90 J
97B9-15.0'	3-Nov-97	mg/Kg	6.48	174.0	0.8320	2.84 J	13.80	8.56	13.40	16,600	14.80	578	0.075 U	20.20 J	2.5 U	0.185 U	2.5 U	19.30	51.90 J
97B9-20.0'	3-Nov-97	mg/Kg	5.95	127.0	0.7470	2.65 J	11.30	8.19	11.80	14,100	15.80	480	0.075 U	16.50 J	2.5 U	0.185 U	2.5 U	18.00	47.80 J
97B9-25.0'	3-Nov-97	mg/Kg	5.93	74.5	0.6960	2.25 J	12.70	7.47	11.80	12,100	16.50	96	0.075 U	13.10 J	2.5 U	0.185 U	2.5 U	16.60	50.50 J
97B10-6"	4-Nov-97	mg/Kg	5.0 U	79.2	0.3830	1.46	8.55	3.19 J	10.10	7,920	24.90	349	0.075 U	10.70	2.5 U	0.185 U	2.5 U	13.20 J	53.90
97B10-5.0'	4-Nov-97	mg/Kg	6.33	150.0	0.9520	3.04	15.70	8.85 J	14.20	17,900	19.10	784	0.075 U	23.20	2.5 U	0.185 U	2.5 U	19.90 J	51.00
97B10-10.0'	4-Nov-97	mg/Kg	7.62	608.0	0.4250	2.92	15.50	10.20 J	15.40	17,500	20.70	706	0.075 U	23.30	2.5 U	0.185 U	2.5 U	19.50 J	61.00
97B10-15.0'	4-Nov-97	mg/Kg	6.58	150.0	0.8480	2.93	16.30	9.29 J	14.50	17,200	15.90	708	0.075 U	23.10	2.5 U	0.185 U	2.5 U	15.80 J	47.70
97B10-20.0'	4-Nov-97	mg/Kg	5.99	157.0	0.6740	2.34	10.60	6.90 J	10.90	13,800	14.60	599	0.075 U	14.80	2.5 U	0.185 U	2.5 U	17.80 J	56.20
97B10-25.0'	4-Nov-97	mg/Kg	8.06	164.0	0.7040	2.45	10.00	7.07 J	12.40	14,200	15.40	628	0.075 U	18.00	2.5 U	0.185 U	2.5 U	8.75	55.20
97B11-6"	5-Nov-97	mg/Kg	5.0 U	47.4	0.1160	1.06	5.51	2.51 J	11.60	4,060	19.40	232	0.075 U	8.27	2.5 U	0.185 U	2.5 U	19.30	43.70
97B11-10.0'	5-Nov-97	mg/Kg	6.40	122.0	0.9000	2.53	14.20	7.52 J	11.80	16,300	16.50	621	0.075 U	19.20	2.5 U	0.200	2.5 U	19.30	49.60
97B11-15.0'	6-Nov-97	mg/Kg	5.0 U	115.0	0.7980	2.48	12.40	7.08 J	12.20	13,100	15.40	647	0.075 U	19.70	2.5 U	0.185 U	2.5 U	14.90	43.10
97B11-20.0'	6-Nov-97	mg/Kg	5.58	161.0	0.7020	2.25	10.40	7.04 J	11.10	12,900	13.10	563	0.075 U	16.80	2.5 U	0.185 U	2.5 U	18.20	114.60
97B11-25.0'	6-Nov-97	mg/Kg	5.99	111.0	0.7000	2.27	10.70	8.75 J	10.80	13,800	15.90	809	0.075 U	17.00	2.5 U	0.185 U	2.5 U	13.90	42.90
97B11-30.0'	6-Nov-97	mg/Kg	5.0 U	125.0	0.5500	1.75	8.97	5.79 J	9.86	9,830	136.00	466	0.075 U	12.10	2.5 U	0.185 U	2.5 U	10.10	52.40 J
97B12-6"	10-Nov-97	mg/Kg	5.0 U	62.9	0.1770	1.41	7.64	2.50 J	12.80	6,580	19.30	411	0.075 U	7.05	2.5 U	0.185 U	2.5 U	18.60	25.30 J
97B12-10.0'	10-Nov-97	mg/Kg	5.0 U	137.0	0.5230	2.86	13.10	5.10 J	25.60	10,400	166.00	415	0.091	15.50	2.5 U	0.185 U	2.610 J	18.60	51.80 J
97B12-15.0'	10-Nov-97	mg/Kg	5.76	144.0	0.7950	2.88	14.40	9.30 J	12.80	14,600	16.80	763	0.075 U	19.40	2.5 U	0.185 U	2.5 U	19.10	55.70 J
97B12-20.0'	10-Nov-97	mg/Kg	5.21	160.0	0.6990	2.71	13.30	8.14 J	12.20	13,400	15.60	673	0.075 U	18.30	2.5 U	0.185 U	2.5 U	17.00	63.30 J
97B12-DUP	10-Nov-97	mg/Kg	5.23	158.0	0.6870	2.77	12.20	8.44 J	11.80	13,200	15.50	712	0.075 U	18.90	2.5 U	0.185 U	2.5 U	8.29	46.60 J
97B13-6"	11-Nov-97	mg/Kg	5.0 U	42.0	0.0532	0.822	4.37	1.33 J	6.87	3,620	9.78	301	0.075 U	5.37	4.190	0.185 U	2.5 U	15.60	56.00 J
97B13-10.0'	11-Nov-97	mg/Kg	6.02	148.0	0.7820	2.85	12.20	9.10 J	11.20	14,900	16.50	750	0.075 U	20.90	2.5 U	0.185 U	2.5 U	16.00	60.80 J
97B13-15.0'	11-Nov-97	mg/Kg	5.0 U	131.0	0.7070	2.80	11.90	8.19 J	11.70	14,400	14.50	679	0.075 U	18.10	2.5 U	0.185 U	2.5 U	16.70	57.40 J
97B13-20.0'	11-Nov-97	mg/Kg	7.72	150.0	0.7300	3.20	13.10	7.55 J	13.30	14,600	16.20	551	0.075 U	16.20	2.5 U	0.190	2.5 U	22.90	74.50 J
97B13-25.0'	11-Nov-97	mg/Kg	5.0 U	142.0	0.6290	2.43	12.20	7.14 J	10.80	13,400	13.10	626	0.075 U	16.60	2.5 U	0.185 U	2.5 U	20.90	48.50
97B13-30.0'	11-Nov-97	mg/Kg	7.53	177.0	0.4910	2.61	9.67	7.80 J	14.70	12,600	12.10	1,810	0.075 U	25.80	2.5 U	0.395	2.5 U	17.50	47.00 J
97B13-DUP	11-Nov-97	mg/Kg	5.30	107.0	0.6990	2.72	12.00	8.55 J	12.70	13,800	14.40	904	0.075 U	19.50	2.5 U	0.185 U	2.5 U	20.00	57.90
97B14-6"	24-Nov-97	mg/Kg	5.95	168.0	0.6930	2.80	10.30	7.03	11.60	14,300	15.80	618	0.075 U	16.20	2.5 U	0.185 U	2.5 U	19.20	76.10

T. 4
SUMMARY OF DETECTED METALS IN SOILS
QUALITY ANALYTICAL SERVICES SITE
BLUE SUMMIT, MO

SAMPLE ID	SAMPLE DATE	UNITS	ARSENIC	BARIUM	BERYLLIUM	CADMIUM	CHROMIUM	COBALT	COPPER	IRON	LEAD	MANGANESE	MERCURY	NICKEL	SILVER	THALLIUM	TIN	VANADIUM	ZINC
97B15-22.0'	25-Nov-97	mg/Kg	5.0 U	99.6	0.492	1.25	8.24	4.57	9.62	8.750	9.88	142	0.0760 R	9.54	2.5 U	0.185 U	2.5 U	13.40	48.30
97B15-DUP	25-Nov-97	mg/Kg	7.09	143.0	0.627	2.06	17.30	5.62	11.20	11.900	13.30	472	0.0910	14.10	2.5 U	0.185 U	2.5 U	17.40	51.10
97B16-6"	26-Nov-97	mg/Kg	7.01	361.0	0.834	2.59	12.70	6.66	16.50	14.800	16.50	566	0.0428 R	18.00	2.5 U	0.340	2.5 U	21.00	55.50
97B16-5.0'	26-Nov-97	mg/Kg	7.55	204.0	0.663	2.26	13.80	6.50	12.10	12.300	14.20	799	0.0770 R	16.90	2.5 U	0.200	2.5 U	19.40	48.30
97B16-10.0'	26-Nov-97	mg/Kg	6.05	149.0	0.600	2.21	10.60	5.66	11.70	11.500	13.50	318	ND(0.075) UR	13.80	2.5 U	0.270	2.5 U	15.60	54.10
97B16-15.0'	26-Nov-97	mg/Kg	18.0	130.0	0.7286	3.64	10.70	5.12	12.20	21.500	14.20	609	0.1330 R	15.50	2.5 U	0.255	2.5 U	25.20	70.40
97B16-20.0'	26-Nov-97	mg/Kg	5.0 U	88.6	0.5406	1.52	11.90	5.52	9.61	10.240	12.10	67	0.0840 R	14.30	2.5 U	0.185 U	2.5 U	16.60	54.60
97B16-22.0'	26-Nov-97	mg/Kg	5.0 U	77.3	0.493	1.37	9.38	5.52	8.85	8.760	9.70	72	0.0930 R	13.40	2.5 U	0.195	2.5 U	11.60	41.60
98B17-0.0'	10-Mar-98	mg/Kg	6.37	172.0	U	2.46	13.50	6.28	12.20	14.800	11.80	488	0.0780	14.90	1.86	0.246	2.5 U	18.60	40.50
98B17-2.5'	10-Mar-98	mg/Kg	8.37	197.0	U	2.46	11.70	7.26	13.80	16.100	13.50	667	0.075 U	16.60	1.03	0.226	2.5 U	16.50	47.40
98B17-5.0'	10-Mar-98	mg/Kg	7.32	153.0	U	2.28	12.20	7.56	13.40	15.800	13.80	536	0.075 U	16.30	1.07	0.297	2.5 U	17.20	46.50
98B18-0.0'	11-Mar-98	mg/Kg	5.0 U	154.0	U	1.72	10.90	4.29	9.78	11.200	6.91	417	0.075 U	10.40	2.05	0.222	2.5 U	15.10	34.10
98B18-2.5'	11-Mar-98	mg/Kg	6.94	198.0	U	2.67	11.50	7.48	13.30	15.600	13.10	612	0.075 U	17.70	1.01	0.280	2.5 U	15.00	50.90
98B18-5.0'	11-Mar-98	mg/Kg	6.66	186.0	U	2.12	11.10	5.81	12.00	15.400	12.00	405	0.075 U	13.20	1.01	0.333	2.5 U	13.70	47.60
98B18-7.5'	11-Mar-98	mg/Kg	9.01	120.0	U	4.20	20.20	7.72	22.00	16.100	21.10	1,420	0.075 U	40.90	1.06	0.283	2.5 U	41.80	118.00
98B19-0.0'	11-Mar-98	mg/Kg	5.11	165.0	U	2.26	13.40	5.27	12.20	15.300	15.30	380	0.075 U	16.10	1.12	0.218	2.5 U	17.60	46.80
98B19-2.5'	11-Mar-98	mg/Kg	5.77	151.0	U	2.33	13.90	6.49	14.30	15.600	14.20	518	0.075 U	16.70	1.53	0.336	2.5 U	20.00	49.00
98B19-5.0'	11-Mar-98	mg/Kg	6.54	139.0	U	2.24	13.20	7.88	14.80	17.680	11.90	597	0.075 U	16.50	1.01	0.370	2.5 U	19.50	47.30
98B19-7.5'	11-Mar-98	mg/Kg	7.68	158.0	U	2.40	12.30	7.96	13.00	17.200	14.10	630	0.075 U	16.70	1.22	0.258	2.5 U	19.00	45.30
98B19-10.0'	11-Mar-98	mg/Kg	10.30	183.0	U	2.35	10.60	7.04	13.30	16.700	12.30	746	0.075 U	19.30	1.24	0.210	2.5 U	16.10	49.10
98B19-12.5'	11-Mar-98	mg/Kg	6.68	188.0	U	2.42	13.20	6.26	11.00	18.900	12.00	465	0.075 U	14.10	1.01	0.372	2.5 U	20.60	56.00
98B19-15.0'	11-Mar-98	mg/Kg	7.91	210.0	U	3.99	10.80	11.40	15.40	21.000	13.30	1,570	0.075 U	38.10	1.25	0.446	2.5 U	21.50	56.60
98B19-16.8"	11-Mar-98	mg/Kg	5.0 U	134.0	U	2.19	13.70	6.70	12.40	14.700	14.60	491	0.075 U	19.40	1.34	0.271	2.5 U	19.70	48.70
DUPLICATE	11-Mar-98	mg/Kg	5.0 U	145.0	U	2.08	16.50	6.11	11.30	14.400	15.10	452	0.075 U	17.90	1.86	0.277	2.5 U	23.80	43.40

7-0-R STRIKETHROUGH INDICATES REJECTED (R) DATA BASED ON ANALYSIS OUTSIDE OF HOLDING TIME
J = VALUES ARE ESTIMATED U = UNDETECTED
B18 Shaded borngs located inside building.

APPENDIX
C

APPENDIX C

Groundwater Data Summary Tables

Table C-1
SUMMARY OF VOCs IN GROUNDWATER (9/2004-5/2005)
QUALITY ANALYTICAL SERVICES SITE, BLUE SUMMIT, MO

SAMPLE LOCATION	COLLECTION DATE	Units	1,1,1,2-TETRACHLOROETHANE	1,1,1-TRICHLOROETHANE	1,1,2,2-TETRACHLOROETHANE	1,1,2-TRICHLOROETHANE	1,1-DICHLOROETHANE	1,1-DICHLOROETHENE	1,1-DICHLOROPROPENE	1,2,3-TRICHLOROBENZENE	1,2,3-TRICHLOROPROPANE	1,2,4-TRICHLOROBENZENE	1,2,4-TRIMETHYLBENZENE
GW-1	9/8/2004	mg/L	0.001 U	0.001 U	0.001 U	0.001 U	0.001 U	0.001 U	0.001 U	0.001 U	0.001 U	0.001 U	0.001 U
GW-1	5/27/2004	mg/L	0.001 U	0.001 U	0.001 U	0.001 U	0.001 U	0.001 U	0.001 U	0.001 U	0.001 U	0.001 U	0.001 U
GW-1	5/13/2005	mg/L	0.001 U	0.001 U	0.001 U	0.001 U	0.001 U	0.001 U	0.001 U	0.001 U	0.001 U	0.001 U	0.001 U
GW-2R	9/8/2004	mg/L	0.001 U	0.001 U	0.001 U	0.001 U	0.001 U	0.001 U	0.001 U	0.001 U	0.001 U	0.001 U	0.001 U
GW-3	9/8/2004	mg/L	0.001 U	0.001 U	0.001 U	0.001 U	0.0038	0.001 U	0.001 U	0.001 U	0.001 U	0.0014 J4	0.008 J4J3
GW-5	9/8/2004	mg/L	0.001 U	0.001 U	0.001 U	0.001 U	0.001 U	0.001 U	0.001 U	0.001 U	0.001 U	0.001 U	0.001 U
GW-5	5/27/2004	mg/L	0.001 U	0.001 U	0.001 U	0.001 U	0.001 U	0.001 U	0.001 U	0.001 U	0.001 U	0.001 U	0.001 U
GW-5	5/13/2005	mg/L	0.001 U	0.001 U	0.001 U	0.001 U	0.001 U	0.001 U	0.001 U	0.001 U	0.001 U	0.001 U	0.001 U
GW-6A	9/8/2004	mg/L	0.001 U	0.001 U	0.001 U	0.001 U	0.001 U	0.001 U	0.001 U	0.001 U	0.001 U	0.001 U	0.001 U
GW-6B	9/9/2004	mg/L	0.001 U	0.001 U	0.001 U	0.001 U	0.0014	0.001 U	0.001 U	0.001 U	0.001 U	0.001 U	0.001 U
GW-6B	5/26/2004	mg/L	0.001 U	0.001 U	0.001 U	0.001 U	0.0034	0.001 U	0.001 U	0.001 U	0.001 U	0.001 U	0.001 U
GW-6B	5/13/2005	mg/L	0.001 U	0.001 U	0.001 U	0.001 U	0.001 U	0.001 U	0.001 U	0.001 U	0.001 U	0.001 U	0.001 U
GW-7	9/8/2004	mg/L	0.001 U	0.001 U	0.001 U	0.001 U	0.001 U	0.001 U	0.001 U	0.001 U	0.001 U	0.001 U	0.001 U
GW-7	5/26/2004	mg/L	0.001 U	0.001 U	0.001 U	0.001 U	0.001 U	0.001 U	0.001 U	0.001 U	0.001 U	0.001 U	0.001 U
GW-7	5/13/2005	mg/L	0.001 U	0.001 U	0.001 U	0.001 U	0.001 U	0.001 U	0.001 U	0.001 U	0.001 U	0.001 U	0.001 U
GW-8A	9/9/2004	mg/L	0.001 U	0.001 U	0.001 U	0.001 U	0.001 U	0.001 U	0.001 U	0.001 U	0.001 U	0.001 U	0.001 U
GW-8B	9/9/2004	mg/L	0.001 U	0.001 U	0.001 U	0.001 U	0.001 U	0.001 U	0.001 U	0.001 U	0.001 U	0.001 U	0.001 U
GW-8B	5/26/2004	mg/L	0.001 U	0.001 U	0.001 U	0.001 U	0.0013	0.001 U	0.001 U	0.001 U	0.001 U	0.001 U	0.001 U
GW-8B	5/11/2005	mg/L	0.001 U	0.001 U	0.001 U	0.001 U	0.001 U	0.001 U	0.001 U	0.001 U	0.001 U	0.001 U	0.001 U
GW-8C	5/11/2005	mg/L	0.001 U	0.001 U	0.001 U	0.001 U	0.0017	0.001 U	0.001 U	0.001 U	0.001 U	0.001 U	0.001 U
GW-9A	9/9/2004	mg/L	0.001 U	0.001 U	0.001 U	0.001 U	0.001 U	0.001 U	0.001 U	0.001 U	0.001 U	0.001 U	0.001 U
GW-9B	9/9/2004	mg/L	0.001 U	0.001 U	0.001 U	0.001 U	0.001 U	0.001 U	0.001 U	0.001 U	0.001 U	0.001 U	0.001 U
GW-9B	5/26/2004	mg/L	0.001 U	0.001 U	0.001 U	0.001 U	0.001 U	0.001 U	0.001 U	0.001 U	0.001 U	0.001 U	0.001 U
GW-9B	5/11/2005	mg/L	0.001 U	0.001 U	0.001 U	0.001 U	0.001 U	0.001 U	0.001 U	0.001 U	0.001 U	0.001 U	0.001 U
GW-10A	9/9/2004	mg/L	0.001 U	0.001 U	0.001 U	0.001 U	0.001 U	0.001 U	0.001 U	0.001 U	0.001 U	0.001 U	0.001 U
GW-10B	9/9/2004	mg/L	0.001 U	0.001 U	0.001 U	0.001 U	0.001 U	0.001 U	0.001 U	0.001 U	0.001 U	0.001 U	0.001 U
GW-10B	5/26/2004	mg/L	0.001 U	0.001 U	0.001 U	0.001 U	0.001 U	0.001 U	0.001 U	0.001 U	0.001 U	0.001 U	0.001 U
GW-10B	5/11/2005	mg/L	0.001 U	0.001 U	0.001 U	0.001 U	0.001 U	0.001 U	0.001 U	0.001 U	0.001 U	0.001 U	0.001 U
GW-10C	5/12/2005	mg/L	0.001 U	0.001 U	0.001 U	0.001 U	0.001 U	0.001 U	0.001 U	0.001 U	0.001 U	0.001 U	0.001 U
GW-11A	9/8/2004	mg/L	0.001 U	0.001 U	0.001 U	0.001 U	0.001 U	0.001 U	0.001 U	0.001 U	0.001 U	0.001 U	0.001 U
GW-11A	5/26/2004	mg/L	0.001 U	0.001 U	0.001 U	0.001 U	0.001 U	0.001 U	0.001 U	0.001 U	0.001 U	0.001 U	0.001 U
GW-11A	5/11/2005	mg/L	0.001 U	0.001 U	0.001 U	0.001 U	0.001 U	0.001 U	0.001 U	0.001 U	0.001 U	0.001 U	0.001 U
GW-11B	9/8/2004	mg/L	0.001 U	0.001 U	0.001 U	0.001 U	0.001 U	0.001 U	0.001 U	0.001 U	0.001 U	0.001 U	0.001 U
GW-11B	5/26/2004	mg/L	0.001 U	0.001 U	0.001 U	0.001 U	0.001 U	0.001 U	0.001 U	0.001 U	0.001 U	0.001 U	0.001 U
GW-11B	5/11/2005	mg/L	0.001 U	0.001 U	0.001 U	0.001 U	0.001 U	0.001 U	0.001 U	0.001 U	0.001 U	0.001 U	0.001 U
GW-11C	9/8/2004	mg/L	0.001 U	0.001 U	0.001 U	0.001 U	0.05	0.003	0.001 U	0.001 U	0.001 U	0.001 U	0.001 U
GW-11C	5/26/2004	mg/L	0.005 U	0.005 U	0.005 U	0.005 U	0.03	0.005 U	0.005 U	0.005 U	0.005 U	0.005 U	0.005 U
GW-11C	5/11/2005	mg/L	0.001 U	0.001 U	0.001 U	0.001 U	0.045	0.0026	0.001 U	0.001 U	0.001 U	0.001 U	0.001 U
GW-12A	9/10/2004	mg/L	0.001 U	0.001 U	0.001 U	0.001 U	0.001 U	0.001 U	0.001 U	0.001 U	0.001 U	0.001 U	0.001 U
GW-12A	5/26/2004	mg/L	0.001 U	0.001 U	0.001 U	0.001 U	0.001 U	0.001 U	0.001 U	0.001 U	0.001 U	0.001 U	0.001 U
GW-12A	5/12/2005	mg/L	0.001 U	0.001 U	0.001 U	0.001 U	0.001 U	0.001 U	0.001 U	0.001 U	0.001 U	0.001 U	0.001 U
GW-12B	9/10/2004	mg/L	0.001 U	0.001 U	0.001 U	0.001 U	0.001 U	0.001 U	0.001 U	0.001 U	0.001 U	0.001 U	0.001 U
GW-12B	5/26/2004	mg/L	0.001 U	0.001 U	0.001 U	0.001 U	0.001 U	0.001 U	0.001 U	0.001 U	0.001 U	0.001 U	0.001 U
GW-12B	5/12/2005	mg/L	0.001 U	0.001 U	0.001 U	0.001 U	0.001 U	0.001 U	0.001 U	0.001 U	0.001 U	0.001 U	0.001 U
GW-12C	9/10/2004	mg/L	0.001 U	0.001 U	0.001 U	0.001 U	0.001 U	0.001 U	0.001 U	0.001 U	0.001 U	0.001 U	0.001 U
GW-12C	5/26/2004	mg/L	0.001 U	0.001 U	0.001 U	0.001 U	0.001	0.001 U	0.001 U	0.001 U	0.001 U	0.001 U	0.001 U
GW-12C	5/12/2005	mg/L	0.001 U	0.001 U	0.001 U	0.001 U	0.001 U	0.001 U	0.001 U	0.001 U	0.001 U	0.001 U	0.001 U
Number of Detects/Samples			0 47	0 47	0 47	0 47	9 47	2 47	0 47	0 47	0 47	0 47	0 47

mg/L = Milligrams per liter

J = Estimated value

U = UNDETECTED

Table 1
SUMMARY OF VOCs IN GROUNDWATER (9/2004-5/2005)
QUALITY ANALYTICAL SERVICES SITE, BLUE SUMMIT, MO

SAMPLE LOCATION	COLLECTION DATE	Units	1,2-DIBROMO-3-CHLORO-PROPANE	1,2-DIBROMOETHANE	1,2-DICHLOROBENZENE	1,2-DICHLOROETHANE	1,2-DICHLOROPROPANE	1,3,5-TRIMETHYLBENZENE
GW-1	9/8/2004	mg/L	0.001 U	0.001 U	0.001 U	0.001 U	0.001 U	0.001 U
GW-1	5/27/2004	mg/L	0.001 U	0.001 U	0.001 U	0.001 U	0.001 U	0.001 U
GW-1	5/13/2005	mg/L	0.001 U	0.001 U	0.001 U	0.001 U	0.001 U	0.001 U
GW-2R	9/8/2004	mg/L	0.001 U	0.001 U	0.001 U	0.001 U	0.001 U	0.001 U
GW-3	9/8/2004	mg/L	0.001 U	0.001 U	0.001 U	0.001 U	0.001 U	0.001 U
GW-5	9/8/2004	mg/L	0.001 U	0.001 U	0.001 U	0.001 U	0.001 U	0.001 U
GW-5	5/27/2004	mg/L	0.001 U	0.001 U	0.001 U	0.001 U	0.001 U	0.001 U
GW-5	5/13/2005	mg/L	0.001 U	0.001 U	0.001 U	0.001 U	0.001 U	0.001 U
GW-6A	9/8/2004	mg/L	0.001 U	0.001 U	0.001 U	0.001 U	0.001 U	0.001 U
GW-6B	9/9/2004	mg/L	0.001 U	0.001 U	0.001 U	0.001 U	0.001 U	0.001 U
GW-6B	5/26/2004	mg/L	0.001 U	0.001 U	0.001 U	0.001 U	0.001 U	0.001 U
GW-6B	5/13/2005	mg/L	0.001 U	0.001 U	0.001 U	0.001 U	0.001 U	0.001 U
GW-7	9/8/2004	mg/L	0.001 U	0.001 U	0.001 U	0.001 U	0.001 U	0.001 U
GW-7	5/26/2004	mg/L	0.001 U	0.001 U	0.001 U	0.001 U	0.001 U	0.001 U
GW-7	5/13/2005	mg/L	0.001 U	0.001 U	0.001 U	0.001 U	0.001 U	0.001 U
GW-8A	9/9/2004	mg/L	0.001 U	0.001 U	0.001 U	0.001 U	0.001 U	0.001 U
GW-8B	9/9/2004	mg/L	0.001 U	0.001 U	0.001 U	0.001 U	0.001 U	0.001 U
GW-8B	5/26/2004	mg/L	0.001 U	0.001 U	0.001 U	0.001 U	0.001 U	0.001 U
GW-8B	5/11/2005	mg/L	0.001 U	0.001 U	0.001 U	0.001 U	0.001 U	0.001 U
GW-8C	5/11/2005	mg/L	0.001 U	0.001 U	0.001 U	0.001 U	0.001 U	0.001 U
GW-9A	9/9/2004	mg/L	0.001 U	0.001 U	0.001 U	0.001 U	0.001 U	0.001 U
GW-9B	9/9/2004	mg/L	0.001 U	0.001 U	0.001 U	0.001 U	0.001 U	0.001 U
GW-9B	5/26/2004	mg/L	0.001 U	0.001 U	0.001 U	0.001 U	0.001 U	0.001 U
GW-9B	5/11/2005	mg/L	0.001 U	0.001 U	0.001 U	0.001 U	0.001 U	0.001 U
GW-10A	9/9/2004	mg/L	0.001 U	0.001 U	0.001 U	0.001 U	0.001 U	0.001 U
GW-10B	9/9/2004	mg/L	0.001 U	0.001 U	0.001 U	0.001 U	0.001 U	0.001 U
GW-10B	5/26/2004	mg/L	0.001 U	0.001 U	0.001 U	0.001 U	0.001 U	0.001 U
GW-10B	5/11/2005	mg/L	0.001 U	0.001 U	0.001 U	0.001 U	0.001 U	0.001 U
GW-10C	5/12/2005	mg/L	0.001 U	0.001 U	0.001 U	0.001 U	0.001 U	0.001 U
GW-11A	9/8/2004	mg/L	0.001 U	0.001 U	0.001 U	0.001 U	0.001 U	0.001 U
GW-11A	5/26/2004	mg/L	0.001 U	0.001 U	0.001 U	0.001 U	0.001 U	0.001 U
GW-11A	5/11/2005	mg/L	0.001 U	0.001 U	0.001 U	0.001 U	0.001 U	0.001 U
GW-11B	9/8/2004	mg/L	0.001 U	0.001 U	0.001 U	0.001 U	0.001 U	0.001 U
GW-11B	5/26/2004	mg/L	0.001 U	0.001 U	0.001 U	0.001 U	0.001 U	0.001 U
GW-11B	5/11/2005	mg/L	0.001 U	0.001 U	0.001 U	0.001 U	0.001 U	0.001 U
GW-11C	9/8/2004	mg/L	0.001 U	0.001 U	0.001 U	0.001 U	0.001 U	0.001 U
GW-11C	5/26/2004	mg/L	0.005 U	0.005 U	0.005 U	0.005 U	0.005 U	0.005 U
GW-11C	5/11/2005	mg/L	0.001 U	0.001 U	0.001 U	0.001 U	0.001 U	0.001 U
GW-12A	9/10/2004	mg/L	0.001 U	0.001 U	0.001 U	0.001 U	0.001 U	0.001 U
GW-12A	5/26/2004	mg/L	0.001 U	0.001 U	0.001 U	0.001 U	0.001 U	0.001 U
GW-12A	5/12/2005	mg/L	0.001 U	0.001 U	0.001 U	0.001 U	0.001 U	0.001 U
GW-12B	9/10/2004	mg/L	0.001 U	0.001 U	0.001 U	0.001 U	0.001 U	0.001 U
GW-12B	5/26/2004	mg/L	0.001 U	0.001 U	0.001 U	0.001 U	0.001 U	0.001 U
GW-12B	5/12/2005	mg/L	0.001 U	0.001 U	0.001 U	0.001 U	0.001 U	0.001 U
GW-12C	9/10/2004	mg/L	0.001 U	0.001 U	0.001 U	0.001 U	0.001 U	0.001 U
GW-12C	5/26/2004	mg/L	0.001 U	0.001 U	0.001 U	0.001 U	0.001 U	0.001 U
GW-12C	5/12/2005	mg/L	0.001 U	0.001 U	0.001 U	0.001 U	0.001 U	0.001 U
Number of Detects/Samples			0 47	0 47	0 47	0 47	0 47	0 47
			mg/L = Milligrams per liter			J = Estimated value		U = UNDETECTED

Table 1
SUMMARY OF VOCs IN GROUNDWATER (9/2004-5/2005)
QUALITY ANALYTICAL SERVICES SITE, BLUE SUMMIT, MO

SAMPLE LOCATION	COLLECTION DATE	Units	1,3-DICHLOROBENZENE	1,3-DICHLOROPROPANE	1,4-DICHLOROBENZENE	1,4-DIOXANE	2,2-DICHLOROPROPANE	2-BUTANONE (MEK)
GW-1	9/8/2004	mg/L	0.001 U	0.001 U	0.001 U	0.0022	0.001 U	0.05 U
GW-1	5/27/2004	mg/L	0.001 U	0.001 U	0.001 U	0.1 U	0.001 U	0.05 U
GW-1	5/13/2005	mg/L	0.001 U	0.001 U	0.001 U	0.1 U	0.001 U	0.05 U
GW-2R	9/8/2004	mg/L	0.0011	0.001 U	0.0063	0.1 U	0.001 U	0.05 U
GW-3	9/8/2004	mg/L	0.0023	0.001 U	0.013	0.27	0.001 U	0.05 U
GW-5	9/8/2004	mg/L	0.001 U	0.001 U	0.001 U	0.0038	0.001 U	0.05 U
GW-5	5/27/2004	mg/L	0.001 U	0.001 U	0.001 U	0.1 U	0.001 U	0.05 U
GW-5	5/13/2005	mg/L	0.001 U	0.001 U	0.001 U	0.1 U	0.001 U	0.05 U
GW-6A	9/8/2004	mg/L	0.001 U	0.001 U	0.001 U	0.0022	0.001 U	0.05 U
GW-6B	9/9/2004	mg/L	0.001 U	0.001 U	0.001 U	0.1 U	0.001 U	0.05 U
GW-6B	5/26/2004	mg/L	0.001 U	0.001 U	0.001 U	0.13	0.001 U	0.05 U
GW-6B	5/13/2005	mg/L	0.001 U	0.001 U	0.001 U	0.1 U	0.001 U	0.05 U
GW-7	9/8/2004	mg/L	0.001 U	0.001 U	0.001 U	0.0035	0.001 U	0.05 U
GW-7	5/26/2004	mg/L	0.001 U	0.001 U	0.001 U	0.1 U	0.001 U	0.05 U
GW-7	5/13/2005	mg/L	0.001 U	0.001 U	0.001 U	0.1 U	0.001 U	0.05 U
GW-8A	9/9/2004	mg/L	0.001 U	0.001 U	0.001 U	0.0025	0.001 U	0.05 U
GW-8B	9/9/2004	mg/L	0.001 U	0.001 U	0.001 U	0.026	0.001 U	0.05 U
GW-8B	5/26/2004	mg/L	0.001 U	0.001 U	0.001 U	0.018	0.001 U	0.05 U
GW-8B	5/11/2005	mg/L	0.001 U	0.001 U	0.001 U	0.1 U	0.001 U	0.05 U
GW-8C	5/11/2005	mg/L	0.001 U	0.001 U	0.001 U	0.1 U	0.001 U	0.05 U
GW-9A	9/9/2004	mg/L	0.001 U	0.001 U	0.001 U	0.0043	0.001 U	0.05 U
GW-9B	9/9/2004	mg/L	0.001 U	0.001 U	0.001 U	0.032	0.001 U	0.05 U
GW-9B	5/26/2004	mg/L	0.001 U	0.001 U	0.001 U	0.023	0.001 U	0.05 U
GW-9B	5/11/2005	mg/L	0.001 U	0.001 U	0.001 U	0.1 U	0.001 U	0.05 U
GW-10A	9/9/2004	mg/L	0.001 U	0.001 U	0.001 U	0.001 U	0.001 U	0.05 U
GW-10B	9/9/2004	mg/L	0.001 U	0.001 U	0.001 U	0.043	0.001 U	0.05 U
GW-10B	5/26/2004	mg/L	0.001 U	0.001 U	0.001 U	0.013	0.001 U	0.05 U
GW-10B	5/11/2005	mg/L	0.001 U	0.001 U	0.001 U	0.1 U	0.001 U	0.05 U
GW-10C	5/12/2005	mg/L	0.001 U	0.001 U	0.001 U	0.14	0.001 U	0.05 U
GW-11A	9/8/2004	mg/L	0.001 U	0.001 U	0.001 U	0.0047	0.001 U	0.05 U
GW-11A	5/26/2004	mg/L	0.001 U	0.001 U	0.001 U	0.1 U	0.001 U	0.05 U
GW-11A	5/11/2005	mg/L	0.001 U	0.001 U	0.001 U	0.1 U	0.001 U	0.05 U
GW-11B	9/8/2004	mg/L	0.001 U	0.001 U	0.001 U	0.036	0.001 U	0.05 U
GW-11B	5/26/2004	mg/L	0.001 U	0.001 U	0.001 U	0.0042	0.001 U	0.05 U
GW-11B	5/11/2005	mg/L	0.001 U	0.001 U	0.001 U	0.1 U	0.001 U	0.05 U
GW-11C	9/8/2004	mg/L	0.001 U	0.001 U	0.001 U	1.2	0.001 U	0.05 U
GW-11C	5/26/2004	mg/L	0.005 U	0.005 U	0.005 U	1.5 E	0.005 U	0.25 U
GW-11C	5/11/2005	mg/L	0.001 U	0.001 U	0.001 U	1.3	0.001 U	0.05 U
GW-12A	9/10/2004	mg/L	0.001 U	0.001 U	0.001 U	0.001 U	0.001 U	0.05 U
GW-12A	5/26/2004	mg/L	0.001 U	0.001 U	0.001 U	0.1 U	0.001 U	0.05 U
GW-12A	5/12/2005	mg/L	0.001 U	0.001 U	0.001 U	0.1 U	0.001 U	0.05 U
GW-12B	9/10/2004	mg/L	0.001 U	0.001 U	0.001 U	0.001 U	0.001 U	0.05 U
GW-12B	5/26/2004	mg/L	0.001 U	0.001 U	0.001 U	0.1 U	0.001 U	0.05 U
GW-12B	5/12/2005	mg/L	0.001 U	0.001 U	0.001 U	0.1 U	0.001 U	0.05 U
GW-12C	9/10/2004	mg/L	0.001 U	0.001 U	0.001 U	0.034	0.001 U	0.05 U
GW-12C	5/26/2004	mg/L	0.001 U	0.001 U	0.001 U	0.1 U	0.001 U	0.05 U
GW-12C	5/12/2005	mg/L	0.001 U	0.001 U	0.001 U	0.1 U	0.001 U	0.05 U
Number of Detects/Samples			2 47	0 47	2 47	21 47	0 47	0 47
			mg/L = Milligrams per liter			J = Estimated value		U = UNDETECTED

Table C-1
SUMMARY OF VOCs IN GROUNDWATER (9/2004-5/2005)
QUALITY ANALYTICAL SERVICES SITE, BLUE SUMMIT, MO

SAMPLE LOCATION	COLLECTION DATE	Units	2-CHLOROETHYL VINYL ETHER	2-CHLOROTOLUENE	2-HEXANONE	4-CHLOROTOLUENE	4-METHYL-2-PENTANONE (MIBK)	ACETONE	ACROLEIN
GW-1	9/8/2004	mg/L	0.01 U	0.001 U	0.05 U	0.001 U	0.05 U	0.05 U	0.05 U
GW-1	5/27/2004	mg/L	0.01 U	0.001 U	0.05 U	0.001 U	0.05 U	0.05 U	0.05 U
GW-1	5/13/2005	mg/L	0.01 U	0.001 U	0.05 U	0.001 U	0.05 U	0.05 U	0.05 U
GW-2R	9/8/2004	mg/L	0.01 U	0.001 U	0.05 U	0.001 U	0.05 U	0.05 U	0.05 U
GW-3	9/8/2004	mg/L	0.01 U	0.001 U	0.05 U	0.001 U	0.05 U	0.05 U	0.05 U
GW-5	9/8/2004	mg/L	0.01 U	0.001 U	0.05 U	0.001 U	0.05 U	0.05 U	0.05 U
GW-5	5/27/2004	mg/L	0.01 U	0.001 U	0.05 U	0.001 U	0.05 U	0.05 U	0.05 U
GW-5	5/13/2005	mg/L	0.01 U	0.001 U	0.05 U	0.001 U	0.05 U	0.05 U	0.05 U
GW-6A	9/8/2004	mg/L	0.01 U	0.001 U	0.05 U	0.001 U	0.05 U	0.05 U	0.05 U
GW-6B	9/9/2004	mg/L	0.01 U	0.001 U	0.05 U	0.001 U	0.05 U	0.05 U	0.05 U
GW-6B	5/26/2004	mg/L	0.01 U	0.001 U	0.05 U	0.001 U	0.05 U	0.05 U	0.05 U
GW-6B	5/13/2005	mg/L	0.01 U	0.001 U	0.05 U	0.001 U	0.05 U	0.05 U	0.05 U
GW-7	9/8/2004	mg/L	0.01 U	0.001 U	0.05 U	0.001 U	0.05 U	0.05 U	0.05 U
GW-7	5/26/2004	mg/L	0.01 U	0.001 U	0.05 U	0.001 U	0.05 U	0.05 U	0.05 U
GW-7	5/13/2005	mg/L	0.01 U	0.001 U	0.05 U	0.001 U	0.05 U	0.05 U	0.05 U
GW-8A	9/9/2004	mg/L	0.01 U	0.001 U	0.05 U	0.001 U	0.05 U	0.05 U	0.05 U
GW-8B	9/9/2004	mg/L	0.01 U	0.001 U	0.05 U	0.001 U	0.05 U	0.05 U	0.05 U
GW-8B	5/26/2004	mg/L	0.01 U	0.001 U	0.05 U	0.001 U	0.05 U	0.05 U	0.05 U
GW-8B	5/11/2005	mg/L	0.01 U	0.001 U	0.05 U	0.001 U	0.05 U	0.05 U	0.05 U
GW-8C	5/11/2005	mg/L	0.01 U	0.001 U	0.05 U	0.001 U	0.05 U	0.05 U	0.05 U
GW-9A	9/9/2004	mg/L	0.01 U	0.001 U	0.05 U	0.001 U	0.05 U	0.05 U	0.05 U
GW-9B	9/9/2004	mg/L	0.01 U	0.001 U	0.05 U	0.001 U	0.05 U	0.05 U	0.05 U
GW-9B	5/26/2004	mg/L	0.01 U	0.001 U	0.05 U	0.001 U	0.05 U	0.05 U	0.05 U
GW-9B	5/11/2005	mg/L	0.01 U	0.001 U	0.05 U	0.001 U	0.05 U	0.05 U	0.05 U
GW-10A	9/9/2004	mg/L	0.01 U	0.001 U	0.05 U	0.001 U	0.05 U	0.05 U	0.05 U
GW-10B	9/9/2004	mg/L	0.01 U	0.001 U	0.05 U	0.001 U	0.05 U	0.05 U	0.05 U
GW-10B	5/26/2004	mg/L	0.01 U	0.001 U	0.05 U	0.001 U	0.05 U	0.05 U	0.05 U
GW-10B	5/11/2005	mg/L	0.01 U	0.001 U	0.05 U	0.001 U	0.05 U	0.05 U	0.05 U
GW-10C	5/12/2005	mg/L	0.01 U	0.001 U	0.05 U	0.001 U	0.05 U	0.05 U	0.05 U
GW-11A	9/8/2004	mg/L	0.01 U	0.001 U	0.05 U	0.001 U	0.05 U	0.05 U	0.05 U
GW-11A	5/26/2004	mg/L	0.01 U	0.001 U	0.05 U	0.001 U	0.05 U	0.05 U	0.05 U
GW-11A	5/11/2005	mg/L	0.01 U	0.001 U	0.05 U	0.001 U	0.05 U	0.05 U	0.05 U
GW-11B	9/8/2004	mg/L	0.01 U	0.001 U	0.05 U	0.001 U	0.05 U	0.05 U	0.05 U
GW-11B	5/26/2004	mg/L	0.01 U	0.001 U	0.05 U	0.001 U	0.05 U	0.05 U	0.05 U
GW-11B	5/11/2005	mg/L	0.01 U	0.001 U	0.05 U	0.001 U	0.05 U	0.05 U	0.05 U
GW-11C	9/8/2004	mg/L	0.01 U	0.001 U	0.05 U	0.001 U	0.05 U	0.05 U	0.05 U
GW-11C	5/26/2004	mg/L	0.05 U	0.005 U	0.25 U	0.005 U	0.25 U	0.25 U	0.25 U
GW-11C	5/11/2005	mg/L	0.01 U	0.001 U	0.05 U	0.001 U	0.05 U	0.05 U	0.05 U
GW-12A	9/10/2004	mg/L	0.01 U	0.001 U	0.05 U	0.001 U	0.05 U	0.05 U	0.05 U
GW-12A	5/26/2004	mg/L	0.01 U	0.001 U	0.05 U	0.001 U	0.05 U	0.05 U	0.05 U
GW-12A	5/12/2005	mg/L	0.01 U	0.001 U	0.05 U	0.001 U	0.05 U	0.05 U	0.05 U
GW-12B	9/10/2004	mg/L	0.01 U	0.001 U	0.05 U	0.001 U	0.05 U	0.05 U	0.05 U
GW-12B	5/26/2004	mg/L	0.01 U	0.001 U	0.05 U	0.001 U	0.05 U	0.05 U	0.05 U
GW-12B	5/12/2005	mg/L	0.01 U	0.001 U	0.05 U	0.001 U	0.05 U	0.05 U	0.05 U
GW-12C	9/10/2004	mg/L	0.01 U	0.001 U	0.05 U	0.001 U	0.05 U	0.05 U	0.05 U
GW-12C	5/26/2004	mg/L	0.01 U	0.001 U	0.05 U	0.001 U	0.05 U	0.05 U	0.05 U
GW-12C	5/12/2005	mg/L	0.01 U	0.001 U	0.05 U	0.001 U	0.05 U	0.05 U	0.05 U
Number of Detects/Samples			0 47	0 47	0 47	0 47	0 47	0 47	0 47

mg/L = Milligrams per liter

J = Estimated value

U = UNDETECTED

mg/L =

Table C-1
SUMMARY OF VOCs IN GROUNDWATER (9/2004-5/2005)
QUALITY ANALYTICAL SERVICES SITE, BLUE SUMMIT, MO

SAMPLE LOCATION	COLLECTION DATE	Units	ACRYLONITRILE	ALLYL CHLORIDE	BENZENE	BROMOBENZENE	BROMOCHLOROMETHANE	BROMODICHLOROMETHANE	BROMOFORM
GW-1	9/8/2004	mg/L	0.05 U	0.05 U	0.001 U	0.001 U	0.001 U	0.001 U	0.001 U
GW-1	5/27/2004	mg/L	0.05 U	0.05 U	0.0011	0.001 U	0.001 U	0.001 U	0.001 U
GW-1	5/13/2005	mg/L	0.05 U	0.05 U	0.001 U	0.001 U	0.001 U	0.001 U	0.001 U
GW-2R	9/8/2004	mg/L	0.05 U	0.05 U	0.0061	0.001 U	0.001 U	0.001 U	0.001 U
GW-3	9/8/2004	mg/L	0.05 U	0.05 U	0.14	0.001 U	0.001 U	0.001 U	0.001 U
GW-5	9/8/2004	mg/L	0.05 U	0.05 U	0.001 U	0.001 U	0.001 U	0.001 U	0.001 U
GW-5	5/27/2004	mg/L	0.05 U	0.05 U	0.001 U	0.001 U	0.001 U	0.001 U	0.001 U
GW-5	5/13/2005	mg/L	0.05 U	0.05 U	0.001 U	0.001 U	0.001 U	0.001 U	0.001 U
GW-6A	9/8/2004	mg/L	0.05 U	0.05 U	0.001 U	0.001 U	0.001 U	0.001 U	0.001 U
GW-6B	9/9/2004	mg/L	0.05 U	0.05 U	0.001 U	0.001 U	0.001 U	0.001 U	0.001 U
GW-6B	5/26/2004	mg/L	0.05 U	0.05 U	0.001 U	0.001 U	0.001 U	0.001 U	0.001 U
GW-6B	5/13/2005	mg/L	0.05 U	0.05 U	0.001 U	0.001 U	0.001 U	0.001 U	0.001 U
GW-7	9/8/2004	mg/L	0.05 U	0.05 U	0.001 U	0.001 U	0.001 U	0.001 U	0.001 U
GW-7	5/26/2004	mg/L	0.05 U	0.05 U	0.001 U	0.001 U	0.001 U	0.001 U	0.001 U
GW-7	5/13/2005	mg/L	0.05 U	0.05 U	0.001 U	0.001 U	0.001 U	0.001 U	0.001 U
GW-8A	9/9/2004	mg/L	0.05 U	0.05 U	0.001 U	0.001 U	0.001 U	0.001 U	0.001 U
GW-8B	9/9/2004	mg/L	0.05 U	0.05 U	0.001 U	0.001 U	0.001 U	0.001 U	0.001 U
GW-8B	5/26/2004	mg/L	0.05 U	0.05 U	0.001 U	0.001 U	0.001 U	0.001 U	0.001 U
GW-8B	5/11/2005	mg/L	0.05 U	0.05 U	0.001 U	0.001 U	0.001 U	0.001 U	0.001 U
GW-8C	5/11/2005	mg/L	0.05 U	0.05 U	0.001 U	0.001 U	0.001 U	0.001 U	0.001 U
GW-9A	9/9/2004	mg/L	0.05 U	0.05 U	0.001 U	0.001 U	0.001 U	0.001 U	0.001 U
GW-9B	9/9/2004	mg/L	0.05 U	0.05 U	0.001 U	0.001 U	0.001 U	0.001 U	0.001 U
GW-9B	5/26/2004	mg/L	0.05 U	0.05 U	0.001 U	0.001 U	0.001 U	0.001 U	0.001 U
GW-9B	5/11/2005	mg/L	0.05 U	0.05 U	0.001 U	0.001 U	0.001 U	0.001 U	0.001 U
GW-10A	9/9/2004	mg/L	0.05 U	0.05 U	0.001 U	0.001 U	0.001 U	0.001 U	0.001 U
GW-10B	9/9/2004	mg/L	0.05 U	0.05 U	0.001 U	0.001 U	0.001 U	0.001 U	0.001 U
GW-10B	5/26/2004	mg/L	0.05 U	0.05 U	0.001 U	0.001 U	0.001 U	0.001 U	0.001 U
GW-10B	5/11/2005	mg/L	0.05 U	0.05 U	0.001 U	0.001 U	0.001 U	0.001 U	0.001 U
GW-10C	5/12/2005	mg/L	0.05 U	0.05 U	0.001 U	0.001 U	0.001 U	0.001 U	0.001 U
GW-11A	9/8/2004	mg/L	0.05 U	0.05 U	0.001 U	0.001 U	0.001 U	0.001 U	0.001 U
GW-11A	5/26/2004	mg/L	0.05 U	0.05 U	0.001 U	0.001 U	0.001 U	0.001 U	0.001 U
GW-11A	5/11/2005	mg/L	0.05 U	0.05 U	0.001 U	0.001 U	0.001 U	0.001 U	0.001 U
GW-11B	9/8/2004	mg/L	0.05 U	0.05 U	0.001 U	0.001 U	0.001 U	0.001 U	0.001 U
GW-11B	5/26/2004	mg/L	0.05 U	0.05 U	0.001 U	0.001 U	0.001 U	0.001 U	0.001 U
GW-11B	5/11/2005	mg/L	0.05 U	0.05 U	0.001 U	0.001 U	0.001 U	0.001 U	0.001 U
GW-11C	9/8/2004	mg/L	0.05 U	0.05 U	0.001 U	0.001 U	0.001 U	0.001 U	0.001 U
GW-11C	5/26/2004	mg/L	0.25 U	0.05 U	0.005 U	0.005 U	0.005 U	0.005 U	0.005 U
GW-11C	5/11/2005	mg/L	0.05 U	0.05 U	0.001	0.001 U	0.001 U	0.001 U	0.001 U
GW-12A	9/10/2004	mg/L	0.05 U	0.05 U	0.001 U	0.001 U	0.001 U	0.001 U	0.001 U
GW-12A	5/26/2004	mg/L	0.05 U	0.05 U	0.001 U	0.001 U	0.001 U	0.001 U	0.001 U
GW-12A	5/12/2005	mg/L	0.05 U	0.05 U	0.001 U	0.001 U	0.001 U	0.001 U	0.001 U
GW-12B	9/10/2004	mg/L	0.05 U	0.05 U	0.001 U	0.001 U	0.001 U	0.001 U	0.001 U
GW-12B	5/26/2004	mg/L	0.05 U	0.05 U	0.001 U	0.001 U	0.001 U	0.001 U	0.001 U
GW-12B	5/12/2005	mg/L	0.05 U	0.05 U	0.001 U	0.001 U	0.001 U	0.001 U	0.001 U
GW-12C	9/10/2004	mg/L	0.05 U	0.05 U	0.001 U	0.001 U	0.001 U	0.001 U	0.001 U
GW-12C	5/26/2004	mg/L	0.05 U	0.05 U	0.001 U	0.001 U	0.001 U	0.001 U	0.001 U
GW-12C	5/12/2005	mg/L	0.05 U	0.05 U	0.001 U	0.001 U	0.001 U	0.001 U	0.001 U
Number of Detects/Samples			0 47	0 47	4 47	0 47	0 47	0 47	0 47
Milligrams per liter			J = Estimated value		U = UNDETECTED		mg/L =		

Table C-1
SUMMARY OF VOCs IN GROUNDWATER (9/2004-5/2005)
QUALITY ANALYTICAL SERVICES SITE, BLUE SUMMIT, MO

SAMPLE LOCATION	COLLECTION DATE	Units	BROMOMETHANE	CARBON DISULFIDE	CARBON TETRACHLORIDE	CHLOROBENZENE	CHLORODIBROMOMETHANE	CHLOROETHANE
GW-1	9/8/2004	mg/L	0.001 U	0.001 U	0.001 U	0.001 U	0.001 U	0.001 U
GW-1	5/27/2004	mg/L	0.001 U	0.001 U	0.001 U	0.001 U	0.001 U	0.001 U
GW-1	5/13/2005	mg/L	0.001 U	0.001 U	0.001 U	0.001 U	0.001 U	0.001 U
GW-2R	9/8/2004	mg/L	0.001 U	0.001 U	0.001 U	0.0032	0.001 U	0.001 U
GW-3	9/8/2004	mg/L	0.001 U	0.001 U	0.001 U	0.0015	0.001 U	0.034
GW-5	9/8/2004	mg/L	0.001 U	0.001 U	0.001 U	0.001 U	0.001 U	0.001 U
GW-5	5/27/2004	mg/L	0.001 U	0.001 U	0.001 U	0.001 U	0.001 U	0.001 U
GW-5	5/13/2005	mg/L	0.001 U	0.001 U	0.001 U	0.001 U	0.001 U	0.001 U
GW-6A	9/8/2004	mg/L	0.001 U	0.001 U	0.001 U	0.001 U	0.001 U	0.001 U
GW-6B	9/9/2004	mg/L	0.001 U	0.001 U	0.001 U	0.001 U	0.001 U	0.001 U
GW-6B	5/26/2004	mg/L	0.001 U	0.001 U	0.001 U	0.001 U	0.001 U	0.001 U
GW-6B	5/13/2005	mg/L	0.001 U	0.001 U	0.001 U	0.001 U	0.001 U	0.001 U
GW-7	9/8/2004	mg/L	0.001 U	0.001 U	0.001 U	0.001 U	0.001 U	0.001 U
GW-7	5/26/2004	mg/L	0.001 U	0.001 U	0.001 U	0.001 U	0.001 U	0.001 U
GW-7	5/13/2005	mg/L	0.001 U	0.001 U	0.001 U	0.001 U	0.001 U	0.001 U
GW-8A	9/9/2004	mg/L	0.001 U	0.001 U	0.001 U	0.001 U	0.001 U	0.001 U
GW-8B	9/9/2004	mg/L	0.001 U	0.001 U	0.001 U	0.001 U	0.001 U	0.001 U
GW-8B	5/26/2004	mg/L	0.001 U	0.001 U	0.001 U	0.001 U	0.001 U	0.001 U
GW-8B	5/11/2005	mg/L	0.001 U	0.001 U	0.001 U	0.001 U	0.001 U	0.001 U
GW-8C	5/11/2005	mg/L	0.001 U	0.001 U	0.001 U	0.001 U	0.001 U	0.001 U
GW-9A	9/9/2004	mg/L	0.001 U	0.001 U	0.001 U	0.001 U	0.001 U	0.001 U
GW-9B	9/9/2004	mg/L	0.001 U	0.001 U	0.001 U	0.001 U	0.001 U	0.001 U
GW-9B	5/26/2004	mg/L	0.001 U	0.001 U	0.001 U	0.001 U	0.001 U	0.001 U
GW-9B	5/11/2005	mg/L	0.001 U	0.001 U	0.001 U	0.001 U	0.001 U	0.001 U
GW-10A	9/9/2004	mg/L	0.001 U	0.001 U	0.001 U	0.001 U	0.001 U	0.001 U
GW-10B	9/9/2004	mg/L	0.001 U	0.001 U	0.001 U	0.001 U	0.001 U	0.001 U
GW-10B	5/26/2004	mg/L	0.001 U	0.001 U	0.001 U	0.001 U	0.001 U	0.001 U
GW-10B	5/11/2005	mg/L	0.001 U	0.001 U	0.001 U	0.001 U	0.001 U	0.001 U
GW-10C	5/12/2005	mg/L	0.001 U	0.001 U	0.001 U	0.001 U	0.001 U	0.001 U
GW-11A	9/8/2004	mg/L	0.001 U	0.001 U	0.001 U	0.001 U	0.001 U	0.001 U
GW-11A	5/26/2004	mg/L	0.001 U	0.001 U	0.001 U	0.001 U	0.001 U	0.001 U
GW-11A	5/11/2005	mg/L	0.001 U	0.001 U	0.001 U	0.001 U	0.001 U	0.001 U
GW-11B	9/8/2004	mg/L	0.001 U	0.001 U	0.001 U	0.001 U	0.001 U	0.001 U
GW-11B	5/26/2004	mg/L	0.001 U	0.001 U	0.001 U	0.001 U	0.001 U	0.001 U
GW-11B	5/11/2005	mg/L	0.001 U	0.001 U	0.001 U	0.001 U	0.001 U	0.001 U
GW-11C	9/8/2004	mg/L	0.001 U	0.001 U	0.001 U	0.001 U	0.001 U	0.001 U
GW-11C	5/26/2004	mg/L	0.005 U	0.005 U	0.005 U	0.005 U	0.005 U	0.005 U
GW-11C	5/11/2005	mg/L	0.001 U	0.001 U	0.001 U	0.001 U	0.001 U	0.0017
GW-12A	9/10/2004	mg/L	0.001 U	0.001 U	0.001 U	0.001 U	0.001 U	0.001 U
GW-12A	5/26/2004	mg/L	0.001 U	0.001 U	0.001 U	0.001 U	0.001 U	0.001 U
GW-12A	5/12/2005	mg/L	0.001 U	0.001 U	0.001 U	0.001 U	0.001 U	0.001 U
GW-12B	9/10/2004	mg/L	0.001 U	0.001 U	0.001 U	0.001 U	0.001 U	0.001 U
GW-12B	5/26/2004	mg/L	0.001 U	0.001 U	0.001 U	0.001 U	0.001 U	0.001 U
GW-12B	5/12/2005	mg/L	0.001 U	0.001 U	0.001 U	0.001 U	0.001 U	0.001 U
GW-12C	9/10/2004	mg/L	0.001 U	0.001 U	0.001 U	0.001 U	0.001 U	0.001 U
GW-12C	5/26/2004	mg/L	0.001 U	0.001 U	0.001 U	0.001 U	0.001 U	0.001 U
GW-12C	5/12/2005	mg/L	0.001 U	0.001 U	0.001 U	0.001 U	0.001 U	0.001 U
Number of Detects/Samples			0 47	0 47	0 47	2 47	0 47	2 47
Milligrams per liter			J = Estimated value		U = UNDETECTED		mg/L =	

Table G-1
SUMMARY OF VOCs IN GROUNDWATER (9/2004-5/2005)
QUALITY ANALYTICAL SERVICES SITE, BLUE SUMMIT, MO

SAMPLE LOCATION	COLLECTION DATE	Units	CHLOROFORM	CHLOROMETHANE	CHLOROPRENE	CIS-1,2-DICHLOROETHENE	CIS-1,3-DICHLOROPROPENE	DIBROMOMETHANE
GW-1	9/8/2004	mg/L	0.005 U	0.001 U		0.0013	0.001 U	0.001 U
GW-1	5/27/2004	mg/L	0.005 U	0.001 U		0.001	0.001 U	0.001 U
GW-1	5/13/2005	mg/L	0.005 U	0.001 U		0.001 U	0.001 U	0.001 U
GW-2R	9/8/2004	mg/L	0.005 U	0.001 U		0.001 U	0.001 U	0.001 U
GW-3	9/8/2004	mg/L	0.005 U	0.001 U		0.001 U	0.001 U	0.001 U
GW-5	9/8/2004	mg/L	0.005 U	0.001 U		0.001 U	0.001 U	0.001 U
GW-5	5/27/2004	mg/L	0.005 U	0.001 U		0.001 U	0.001 U	0.001 U
GW-5	5/13/2005	mg/L	0.005 U	0.001 U		0.001 U	0.001 U	0.001 U
GW-6A	9/8/2004	mg/L	0.005 U	0.001 U		0.001 U	0.001 U	0.001 U
GW-6B	9/9/2004	mg/L	0.005 U	0.001 U		0.013	0.001 U	0.001 U
GW-6B	5/26/2004	mg/L	0.005 U	0.001 U		0.02	0.001 U	0.001 U
GW-6B	5/13/2005	mg/L	0.005 U	0.001 U		0.0013	0.001 U	0.001 U
GW-7	9/8/2004	mg/L	0.005 U	0.001 U		0.001 U	0.001 U	0.001 U
GW-7	5/26/2004	mg/L	0.005 U	0.001 U		0.001 U	0.001 U	0.001 U
GW-7	5/13/2005	mg/L	0.005 U	0.001 U		0.001 U	0.001 U	0.001 U
GW-8A	9/9/2004	mg/L	0.005 U	0.001 U		0.001 U	0.001 U	0.001 U
GW-8B	9/9/2004	mg/L	0.005 U	0.001 U		0.0011	0.001 U	0.001 U
GW-8B	5/26/2004	mg/L	0.005 U	0.001 U		0.002	0.001 U	0.001 U
GW-8B	5/11/2005	mg/L	0.005 U	0.001 U		0.001 U	0.001 U	0.001 U
GW-8C	5/11/2005	mg/L	0.005 U	0.001 U		0.006	0.001 U	0.001 U
GW-9A	9/9/2004	mg/L	0.005 U	0.001 U		0.0026	0.001 U	0.001 U
GW-9B	9/9/2004	mg/L	0.005 U	0.001 U		0.001 U	0.001 U	0.001 U
GW-9B	5/26/2004	mg/L	0.005 U	0.001 U		0.005	0.001 U	0.001 U
GW-9B	5/11/2005	mg/L	0.005 U	0.001 U		0.001 U	0.001 U	0.001 U
GW-10A	9/9/2004	mg/L	0.005 U	0.001 U		0.001 U	0.001 U	0.001 U
GW-10B	9/9/2004	mg/L	0.005 U	0.001 U		0.0024	0.001 U	0.001 U
GW-10B	5/26/2004	mg/L	0.005 U	0.001 U		0.0011	0.001 U	0.001 U
GW-10B	5/11/2005	mg/L	0.005 U	0.001 U		0.001 U	0.001 U	0.001 U
GW-10C	5/12/2005	mg/L	0.005 U	0.001 U		0.001 U	0.001 U	0.001 U
GW-11A	9/8/2004	mg/L	0.005 U	0.001 U		0.001 U	0.001 U	0.001 U
GW-11A	5/26/2004	mg/L	0.005 U	0.001 U		0.001 U	0.001 U	0.001 U
GW-11A	5/11/2005	mg/L	0.005 U	0.001 U		0.001 U	0.001 U	0.001 U
GW-11B	9/8/2004	mg/L	0.005 U	0.001 U		0.001 U	0.001 U	0.001 U
GW-11B	5/26/2004	mg/L	0.005 U	0.001 U		0.001 U	0.001 U	0.001 U
GW-11B	5/11/2005	mg/L	0.005 U	0.001 U		0.001 U	0.001 U	0.001 U
GW-11C	9/8/2004	mg/L	0.005 U	0.001 U		0.19	0.001 U	0.001 U
GW-11C	5/26/2004	mg/L	0.025 U	0.005 U		0.041	0.005 U	0.005 U
GW-11C	5/11/2005	mg/L	0.005 U	0.001 U		0.11	0.001 U	0.001 U
GW-12A	9/10/2004	mg/L	0.005 U	0.001 U		0.001 U	0.001 U	0.001 U
GW-12A	5/26/2004	mg/L	0.005 U	0.001 U		0.001 U	0.001 U	0.001 U
GW-12A	5/12/2005	mg/L	0.005 U	0.001 U		0.0026	0.001 U	0.001 U
GW-12B	9/10/2004	mg/L	0.005 U	0.001 U		0.0013	0.001 U	0.001 U
GW-12B	5/26/2004	mg/L	0.005 U	0.001 U		0.001 U	0.001 U	0.001 U
GW-12B	5/12/2005	mg/L	0.005 U	0.001 U		0.001 U	0.001 U	0.001 U
GW-12C	9/10/2004	mg/L	0.005 U	0.001 U		0.0072	0.001 U	0.001 U
GW-12C	5/26/2004	mg/L	0.005 U	0.001 U		0.042	0.001 U	0.001 U
GW-12C	5/12/2005	mg/L	0.005 U	0.001 U		0.0019	0.001 U	0.001 U
Number of Detects/Samples			0 47	0 47	0 0	20 47	0 47	0 47

Milligrams per liter J = Estimated value

U = UNDETECTED

Table 8-1
SUMMARY OF VOCs IN GROUNDWATER (9/2004-5/2005)
QUALITY ANALYTICAL SERVICES SITE, BLUE SUMMIT, MO

SAMPLE LOCATION	COLLECTION DATE	Units	DICHLORODIFLUOROMETHANE	DI-ISOPROPYL ETHER	ETHYL METHACRYLATE	ETHYLBENZENE	HEXACHLOROBUTADIENE	IODOMETHANE
GW-1	9/8/2004	mg/L	0.001 U	0.001 U	0.005 U	0.001 U	0.001 U	0.05 U
GW-1	5/27/2004	mg/L	0.001 U	0.001 U	0.005 U	0.001 U	0.001 U	0.05 U
GW-1	5/13/2005	mg/L	0.001 U	0.001 U	0.005 U	0.001 U	0.001 U	0.05 U
GW-2R	9/8/2004	mg/L	0.001 U	0.001 U	0.005 U	0.001 U	0.001 U	0.05 U
GW-3	9/8/2004	mg/L	0.001 U	0.001 U	0.005 U	0.001 U	0.001 U	0.05 U
GW-5	9/8/2004	mg/L	0.001 U	0.001 U	0.005 U	0.001 U	0.001 U	0.05 U
GW-5	5/27/2004	mg/L	0.001 U	0.001 U	0.005 U	0.001 U	0.001 U	0.05 U
GW-5	5/13/2005	mg/L	0.001 U	0.001 U	0.005 U	0.001 U	0.001 U	0.05 U
GW-6A	9/8/2004	mg/L	0.001 U	0.001 U	0.005 U	0.001 U	0.001 U	0.05 U
GW-6B	9/9/2004	mg/L	0.001 U	0.001 U	0.005 U	0.001 U	0.001 U	0.05 U
GW-6B	5/26/2004	mg/L	0.001 U	0.001 U	0.005 U	0.001 U	0.001 U	0.05 U
GW-6B	5/13/2005	mg/L	0.001 U	0.001 U	0.005 U	0.001 U	0.001 U	0.05 U
GW-7	9/8/2004	mg/L	0.001 U	0.001 U	0.005 U	0.001 U	0.001 U	0.05 U
GW-7	5/26/2004	mg/L	0.001 U	0.001 U	0.005 U	0.001 U	0.001 U	0.05 U
GW-7	5/13/2005	mg/L	0.001 U	0.001 U	0.005 U	0.001 U	0.001 U	0.05 U
GW-8A	9/9/2004	mg/L	0.001 U	0.001 U	0.005 U	0.001 U	0.001 U	0.05 U
GW-8B	9/9/2004	mg/L	0.001 U	0.001 U	0.005 U	0.001 U	0.001 U	0.05 U
GW-8B	5/26/2004	mg/L	0.001 U	0.001 U	0.005 U	0.001 U	0.001 U	0.05 U
GW-8B	5/11/2005	mg/L	0.001 U	0.001 U	0.005 U	0.001 U	0.001 U	0.05 U
GW-8C	5/11/2005	mg/L	0.001 U	0.001 U	0.005 U	0.001 U	0.001 U	0.05 U
GW-9A	9/9/2004	mg/L	0.001 U	0.001 U	0.005 U	0.001 U	0.001 U	0.05 U
GW-9B	9/9/2004	mg/L	0.001 U	0.001 U	0.005 U	0.001 U	0.001 U	0.05 U
GW-9B	5/26/2004	mg/L	0.001 U	0.001 U	0.005 U	0.001 U	0.001 U	0.05 U
GW-9B	5/11/2005	mg/L	0.001 U	0.001 U	0.005 U	0.001 U	0.001 U	0.05 U
GW-10A	9/9/2004	mg/L	0.001 U	0.001 U	0.005 U	0.001 U	0.001 U	0.05 U
GW-10B	9/9/2004	mg/L	0.001 U	0.001 U	0.005 U	0.001 U	0.001 U	0.05 U
GW-10B	5/26/2004	mg/L	0.001 U	0.001 U	0.005 U	0.001 U	0.001 U	0.05 U
GW-10B	5/11/2005	mg/L	0.001 U	0.001 U	0.005 U	0.001 U	0.001 U	0.05 U
GW-10C	5/12/2005	mg/L	0.001 U	0.001 U	0.005 U	0.001 U	0.001 U	0.05 U
GW-11A	9/8/2004	mg/L	0.001 U	0.001 U	0.005 U	0.001 U	0.001 U	0.05 U
GW-11A	5/26/2004	mg/L	0.001 U	0.001 U	0.005 U	0.001 U	0.001 U	0.05 U
GW-11A	5/11/2005	mg/L	0.001 U	0.001 U	0.005 U	0.001 U	0.001 U	0.05 U
GW-11B	9/8/2004	mg/L	0.001 U	0.001 U	0.005 U	0.001 U	0.001 U	0.05 U
GW-11B	5/26/2004	mg/L	0.001 U	0.001 U	0.005 U	0.001 U	0.001 U	0.05 U
GW-11B	5/11/2005	mg/L	0.001 U	0.001 U	0.005 U	0.001 U	0.001 U	0.05 U
GW-11C	9/8/2004	mg/L	0.001 U	0.001 U	0.005 U	0.001 U	0.001 U	0.05 U
GW-11C	5/26/2004	mg/L	0.005 U	0.005 U	0.005 U	0.005 U	0.005 U	0.25 U
GW-11C	5/11/2005	mg/L	0.001 U	0.001 U	0.005 U	0.001 U	0.001 U	0.05 U
GW-12A	9/10/2004	mg/L	0.001 U	0.001 U	0.005 U	0.001 U	0.001 U	0.05 U
GW-12A	5/26/2004	mg/L	0.001 U	0.001 U	0.005 U	0.001 U	0.001 U	0.05 U
GW-12A	5/12/2005	mg/L	0.001 U	0.001 U	0.005 U	0.001 U	0.001 U	0.05 U
GW-12B	9/10/2004	mg/L	0.001 U	0.001 U	0.005 U	0.001 U	0.001 U	0.05 U
GW-12B	5/26/2004	mg/L	0.001 U	0.001 U	0.005 U	0.001 U	0.001 U	0.05 U
GW-12B	5/12/2005	mg/L	0.001 U	0.001 U	0.005 U	0.001 U	0.001 U	0.05 U
GW-12C	9/10/2004	mg/L	0.001 U	0.001 U	0.005 U	0.001 U	0.001 U	0.05 U
GW-12C	5/26/2004	mg/L	0.001 U	0.001 U	0.005 U	0.001 U	0.001 U	0.05 U
GW-12C	5/12/2005	mg/L	0.001 U	0.001 U	0.005 U	0.001 U	0.001 U	0.05 U
Number of Detects/Samples			0 47	0 47	0 47	0 47	0 47	0 47

mg/L = Milligrams per liter

J = Estimated value

U = UNDETECTED

Table C-1
SUMMARY OF VOCs IN GROUNDWATER (9/2004-5/2005)
QUALITY ANALYTICAL SERVICES SITE, BLUE SUMMIT, MO

SAMPLE LOCATION	COLLECTION DATE	Units	ISOPROPYL- BENZENE	METHACRYLONITRILE	METHYL METHACRYLATE	METHYL TERT- BUTYL ETHER	METHYLENE CHLORIDE	NAPHTHALENE	N-BUTYLBENZENE	N-PROPYLBENZENE
GW-1	9/8/2004	mg/L	0.001 U	0.05 U	0.05 U	0.001 U	0.005 U	0.005 U	0.001 U	0.001 U
GW-1	5/27/2004	mg/L	0.001 U	0.05 U	0.05 U	0.001 U	0.005 U	0.005 U	0.001 U	0.001 U
GW-1	5/13/2005	mg/L	0.001 U	0.05 U	0.05 U	0.001 U	0.005 U	0.005 U	0.001 U	0.001 U
GW-2R	9/8/2004	mg/L	0.0034	0.05 U	0.05 U	0.0019 J4J3	0.005 U	0.005 U	0.0022	0.0035
GW-3	9/8/2004	mg/L	0.002	0.05 U	0.05 U	0.011 J4J3	0.005 U	0.01 U	0.001 U	0.0027
GW-5	9/8/2004	mg/L	0.001 U	0.05 U	0.05 U	0.001 U	0.005 U	0.005 U	0.001 U	0.001 U
GW-5	5/27/2004	mg/L	0.001 U	0.05 U	0.05 U	0.001 U	0.005 U	0.005 U	0.001 U	0.001 U
GW-5	5/13/2005	mg/L	0.001 U	0.05 U	0.05 U	0.001 U	0.005 U	0.005 U	0.001 U	0.001 U
GW-6A	9/8/2004	mg/L	0.001 U	0.05 U	0.05 U	0.001 U	0.005 U	0.01 U	0.001 U	0.001 U
GW-6B	9/9/2004	mg/L	0.001 U	0.05 U	0.05 U	0.0021 J4	0.005 U	0.005 U	0.001 U	0.001 U
GW-6B	5/26/2004	mg/L	0.001 U	0.05 U	0.05 U	0.009	0.005 U	0.005 U	0.001 U	0.001 U
GW-6B	5/13/2005	mg/L	0.001 U	0.05 U	0.05 U	0.001 U	0.005 U	0.005 U	0.001 U	0.001 U
GW-7	9/8/2004	mg/L	0.001 U	0.05 U	0.05 U	0.001 U	0.005 U	0.005 U	0.001 U	0.001 U
GW-7	5/26/2004	mg/L	0.001 U	0.05 U	0.05 U	0.001 U	0.005 U	0.005 U	0.001 U	0.001 U
GW-7	5/13/2005	mg/L	0.001 U	0.05 U	0.05 U	0.001 U	0.005 U	0.005 U	0.001 U	0.001 U
GW-8A	9/9/2004	mg/L	0.001 U	0.05 U	0.05 U	0.001 U	0.005 U	0.005 U	0.001 U	0.001 U
GW-8B	9/9/2004	mg/L	0.001 U	0.05 U	0.05 U	0.001 U	0.005 U	0.005 U	0.001 U	0.001 U
GW-8B	5/26/2004	mg/L	0.001 U	0.05 U	0.05 U	0.0014	0.005 U	0.005 U	0.001 U	0.001 U
GW-8B	5/11/2005	mg/L	0.001 U	0.05 U	0.05 U	0.001 U	0.005 U	0.005 U	0.001 U	0.001 U
GW-8C	5/11/2005	mg/L	0.001 U	0.05 U	0.05 U	0.0011	0.005 U	0.005 U	0.001 U	0.001 U
GW-9A	9/9/2004	mg/L	0.001 U	0.05 U	0.05 U	0.001 U	0.005 U	0.005 U	0.001 U	0.001 U
GW-9B	9/9/2004	mg/L	0.001 U	0.05 U	0.05 U	0.001 U	0.005 U	0.005 U	0.001 U	0.001 U
GW-9B	5/26/2004	mg/L	0.001 U	0.05 U	0.05 U	0.0019	0.005 U	0.005 U	0.001 U	0.001 U
GW-9B	5/11/2005	mg/L	0.001 U	0.05 U	0.05 U	0.001 U	0.005 U	0.005 U	0.001 U	0.001 U
GW-10A	9/9/2004	mg/L	0.001 U	0.05 U	0.05 U	0.001 U	0.005 U	0.01 U	0.001 U	0.001 U
GW-10B	9/9/2004	mg/L	0.001 U	0.05 U	0.05 U	0.0012 J4	0.005 U	0.005 U	0.001 U	0.001 U
GW-10B	5/26/2004	mg/L	0.001 U	0.05 U	0.05 U	0.001 U	0.005 U	0.01 U	0.001 U	0.001 U
GW-10B	5/11/2005	mg/L	0.001 U	0.05 U	0.05 U	0.001 U	0.005 U	0.005 U	0.001 U	0.001 U
GW-10C	5/12/2005	mg/L	0.001 U	0.05 U	0.05 U	0.001 U	0.005 U	0.005 U	0.001 U	0.001 U
GW-11A	9/8/2004	mg/L	0.001 U	0.05 U	0.05 U	0.001 U	0.005 U	0.005 U	0.001 U	0.001 U
GW-11A	5/26/2004	mg/L	0.001 U	0.05 U	0.05 U	0.001 U	0.005 U	0.005 U	0.001 U	0.001 U
GW-11A	5/11/2005	mg/L	0.001 U	0.05 U	0.05 U	0.001 U	0.005 U	0.005 U	0.001 U	0.001 U
GW-11B	9/8/2004	mg/L	0.001 U	0.05 U	0.05 U	0.0026 J4J3	0.005 U	0.005 U	0.001 U	0.001 U
GW-11B	5/26/2004	mg/L	0.001 U	0.05 U	0.05 U	0.001 U	0.005 U	0.005 U	0.001 U	0.001 U
GW-11B	5/11/2005	mg/L	0.001 U	0.05 U	0.05 U	0.001 U	0.005 U	0.005 U	0.001 U	0.001 U
GW-11C	9/8/2004	mg/L	0.001 U	0.05 U	0.05 U	0.011 J4J3	0.005 U	0.005 U	0.001 U	0.001 U
GW-11C	5/26/2004	mg/L	0.005 U	0.05 U	0.05 U	0.0077	0.025 U	0.005 U	0.005 U	0.005 U
GW-11C	5/11/2005	mg/L	0.001 U	0.05 U	0.05 U	0.0068	0.005 U	0.005 U	0.001 U	0.001 U
GW-12A	9/10/2004	mg/L	0.001 U	0.05 U	0.05 U	0.001 U	0.005 U	0.01 U	0.001 U	0.001 U
GW-12A	5/26/2004	mg/L	0.001 U	0.05 U	0.05 U	0.001 U	0.005 U	0.005 U	0.001 U	0.001 U
GW-12A	5/12/2005	mg/L	0.001 U	0.05 U	0.05 U	0.001 U	0.005 U	0.005 U	0.001 U	0.001 U
GW-12B	9/10/2004	mg/L	0.001 U	0.05 U	0.05 U	0.001 U	0.005 U	0.025 U	0.001 U	0.001 U
GW-12B	5/26/2004	mg/L	0.001 U	0.05 U	0.05 U	0.001 U	0.005 U	0.005 U	0.001 U	0.001 U
GW-12B	5/12/2005	mg/L	0.001 U	0.05 U	0.05 U	0.001 U	0.005 U	0.005 U	0.001 U	0.001 U
GW-12C	9/10/2004	mg/L	0.001 U	0.05 U	0.05 U	0.001 U	0.005 U	0.01 U	0.001 U	0.001 U
GW-12C	5/26/2004	mg/L	0.001 U	0.05 U	0.05 U	0.001 U	0.005 U	0.005 U	0.001 U	0.001 U
GW-12C	5/12/2005	mg/L	0.001 U	0.05 U	0.05 U	0.001 U	0.005 U	0.005 U	0.001 U	0.001 U
Number of Detects/Samples			2 47	0 47	0 47	6 47	0 47	0 47	1 47	2 47

mg/L = Milligrams per liter

J = Estimated value

U = UNDETECTED

Table C-1
SUMMARY OF VOCs IN GROUNDWATER (9/2004-5/2005)
QUALITY ANALYTICAL SERVICES SITE, BLUE SUMMIT, MO

SAMPLE LOCATION	COLLECTION DATE	Units	PENTA-CHLOROETHANE	P-ISOPROPYL-TOLUENE	PROPIONITRILE	SEC-BUTYLBENZENE	STYRENE	TERT-BUTYLBENZENE	TETRA-CHLOROETHENE	TOLUENE	TRANS-1,2-DICHLOROETHENE
GW-1	9/8/2004	mg/L	0.05 U	0.001 U	0.05 U	0.001 U	0.001 U	0.001 U	0.001 U	0.005 U	0.001 U
GW-1	5/27/2004	mg/L	0.05 U	0.001 U	0.05 U	0.001 U	0.001 U	0.001 U	0.001 U	0.005 U	0.001 U
GW-1	5/13/2005	mg/L	0.05 U	0.001 U	0.05 U	0.001 U	0.001 U	0.001 U	0.001 U	0.005 U	0.001 U
GW-2R	9/8/2004	mg/L	0.05 U	0.001 U	0.05 U	0.0022	0.001 U	0.001 U	0.001 U	0.005 U	0.001 U
GW-3	9/8/2004	mg/L	0.05 U	0.001 U	0.05 U	0.001 U	0.001 U	0.001 U	0.001 U	0.005 U	0.001 U
GW-5	9/8/2004	mg/L	0.05 U	0.001 U	0.05 U	0.001 U	0.001 U	0.001 U	0.001 U	0.005 U	0.001 U
GW-5	5/27/2004	mg/L	0.05 U	0.001 U	0.05 U	0.001 U	0.001 U	0.001 U	0.001 U	0.005 U	0.001 U
GW-5	5/13/2005	mg/L	0.05 U	0.001 U	0.05 U	0.001 U	0.001 U	0.001 U	0.001 U	0.005 U	0.001 U
GW-6A	9/8/2004	mg/L	0.05 U	0.001 U	0.05 U	0.001 U	0.001 U	0.001 U	0.001 U	0.005 U	0.001 U
GW-6B	9/9/2004	mg/L	0.05 U	0.001 U	0.05 U	0.001 U	0.001 U	0.001 U	0.001 U	0.005 U	0.001 U
GW-6B	5/26/2004	mg/L	0.05 U	0.001 U	0.05 U	0.001 U	0.001 U	0.001 U	0.001 U	0.005 U	0.001 U
GW-6B	5/13/2005	mg/L	0.05 U	0.001 U	0.05 U	0.001 U	0.001 U	0.001 U	0.001 U	0.005 U	0.001 U
GW-7	9/8/2004	mg/L	0.05 U	0.001 U	0.05 U	0.001 U	0.001 U	0.001 U	0.001 U	0.005 U	0.001 U
GW-7	5/26/2004	mg/L	0.05 U	0.001 U	0.05 U	0.001 U	0.001 U	0.001 U	0.001 U	0.005 U	0.001 U
GW-7	5/13/2005	mg/L	0.05 U	0.001 U	0.05 U	0.001 U	0.001 U	0.001 U	0.001 U	0.005 U	0.001 U
GW-8A	9/9/2004	mg/L	0.05 U	0.001 U	0.05 U	0.001 U	0.001 U	0.001 U	0.001 U	0.005 U	0.001 U
GW-8B	9/9/2004	mg/L	0.05 U	0.001 U	0.05 U	0.001 U	0.001 U	0.001 U	0.001 U	0.005 U	0.001 U
GW-8B	5/26/2004	mg/L	0.05 U	0.001 U	0.05 U	0.001 U	0.001 U	0.001 U	0.001 U	0.005 U	0.001 U
GW-8B	5/11/2005	mg/L	0.05 U	0.001 U	0.05 U	0.001 U	0.001 U	0.001 U	0.001 U	0.005 U	0.001 U
GW-8C	5/11/2005	mg/L	0.05 U	0.001 U	0.05 U	0.001 U	0.001 U	0.001 U	0.001 U	0.005 U	0.001 U
GW-9A	9/9/2004	mg/L	0.05 U	0.001 U	0.05 U	0.001 U	0.001 U	0.001 U	0.001 U	0.005 U	0.001 U
GW-9B	9/9/2004	mg/L	0.05 U	0.001 U	0.05 U	0.001 U	0.001 U	0.001 U	0.001 U	0.005 U	0.001 U
GW-9B	5/26/2004	mg/L	0.05 U	0.001 U	0.05 U	0.001 U	0.001 U	0.001 U	0.001 U	0.005 U	0.001 U
GW-9B	5/11/2005	mg/L	0.05 U	0.001 U	0.05 U	0.001 U	0.001 U	0.001 U	0.001 U	0.005 U	0.001 U
GW-10A	9/9/2004	mg/L	0.05 U	0.001 U	0.05 U	0.001 U	0.001 U	0.001 U	0.001 U	0.005 U	0.001 U
GW-10B	9/9/2004	mg/L	0.05 U	0.001 U	0.05 U	0.001 U	0.001 U	0.001 U	0.001 U	0.005 U	0.001 U
GW-10B	5/26/2004	mg/L	0.05 U	0.001 U	0.05 U	0.001 U	0.001 U	0.001 U	0.001 U	0.005 U	0.001 U
GW-10B	5/11/2005	mg/L	0.05 U	0.001 U	0.05 U	0.001 U	0.001 U	0.001 U	0.001 U	0.005 U	0.001 U
GW-10C	5/12/2005	mg/L	0.05 U	0.001 U	0.05 U	0.001 U	0.001 U	0.001 U	0.001 U	0.005 U	0.001 U
GW-11A	9/8/2004	mg/L	0.05 U	0.001 U	0.05 U	0.001 U	0.001 U	0.001 U	0.001 U	0.005 U	0.001 U
GW-11A	5/26/2004	mg/L	0.05 U	0.001 U	0.05 U	0.001 U	0.001 U	0.001 U	0.001 U	0.005 U	0.001 U
GW-11A	5/11/2005	mg/L	0.05 U	0.001 U	0.05 U	0.001 U	0.001 U	0.001 U	0.001 U	0.005 U	0.001 U
GW-11B	9/8/2004	mg/L	0.05 U	0.001 U	0.05 U	0.001 U	0.001 U	0.001 U	0.001 U	0.005 U	0.001 U
GW-11B	5/26/2004	mg/L	0.05 U	0.001 U	0.05 U	0.001 U	0.001 U	0.001 U	0.001 U	0.005 U	0.001 U
GW-11B	5/11/2005	mg/L	0.05 U	0.001 U	0.05 U	0.001 U	0.001 U	0.001 U	0.001 U	0.005 U	0.001 U
GW-11C	9/8/2004	mg/L	0.05 U	0.001 U	0.05 U	0.001 U	0.001 U	0.001 U	0.001 U	0.005 U	0.0011
GW-11C	5/26/2004	mg/L	0.05 U	0.005 U	0.05 U	0.005 U	0.005 U	0.005 U	0.005 U	0.025 U	0.005 U
GW-11C	5/11/2005	mg/L	0.05 U	0.001 U	0.05 U	0.001 U	0.001 U	0.001 U	0.001 U	0.005 U	0.001 U
GW-12A	9/10/2004	mg/L	0.05 U	0.001 U	0.05 U	0.001 U	0.001 U	0.001 U	0.001 U	0.005 U	0.001 U
GW-12A	5/26/2004	mg/L	0.05 U	0.001 U	0.05 U	0.001 U	0.001 U	0.001 U	0.001 U	0.005 U	0.001 U
GW-12A	5/12/2005	mg/L	0.05 U	0.001 U	0.05 U	0.001 U	0.001 U	0.001 U	0.001 U	0.005 U	0.001 U
GW-12B	9/10/2004	mg/L	0.05 U	0.001 U	0.05 U	0.001 U	0.001 U	0.001 U	0.001 U	0.005 U	0.001 U
GW-12B	5/26/2004	mg/L	0.05 U	0.001 U	0.05 U	0.001 U	0.001 U	0.001 U	0.001 U	0.005 U	0.001 U
GW-12B	5/12/2005	mg/L	0.05 U	0.001 U	0.05 U	0.001 U	0.001 U	0.001 U	0.001 U	0.005 U	0.001 U
GW-12C	9/10/2004	mg/L	0.05 U	0.001 U	0.05 U	0.001 U	0.001 U	0.001 U	0.001 U	0.005 U	0.001 U
GW-12C	5/26/2004	mg/L	0.05 U	0.001 U	0.05 U	0.001 U	0.001 U	0.001 U	0.001 U	0.005 U	0.001 U
GW-12C	5/12/2005	mg/L	0.05 U	0.001 U	0.05 U	0.001 U	0.001 U	0.001 U	0.001 U	0.005 U	0.001 U
Number of Detects/Samples			0 47	0 47	0 47	1 47	0 47	0 47	0 47	0 47	1 47

J = Estimated value

U = UNDETECTED

mg/L = Milligrams per liter

Table C-1
SUMMARY OF VOCs IN GROUNDWATER (9/2004-5/2005)
QUALITY ANALYTICAL SERVICES SITE, BLUE SUMMIT, MO

SAMPLE LOCATION	COLLECTION DATE	Units	TRANS-1,3-DICHLORO-PROPENE	TRANS-1,4-DICHLORO-2-BUTENE	TRICHLOROETHENE	TRICHLORO-FLUOROMETHANE	VINYL CHLORIDE	XYLENES, TOTAL
GW-1	9/8/2004	mg/L	0.001 U	0.001 U	0.001 U	0.001 U	0.001 U	0.003 U
GW-1	5/27/2004	mg/L	0.001 U	0.001 U	0.001 U	0.001 U	0.001 U	0.003 U
GW-1	5/13/2005	mg/L	0.001 U	0.001 U	0.001 U	0.001 U	0.001 U	0.003
GW-2R	9/8/2004	mg/L	0.001 U	0.001 U	0.001 U	0.001 U	0.001 U	0.003 U
GW-3	9/8/2004	mg/L	0.001 U	0.001 U	0.001 U	0.001 U	0.001 U	0.022 J4J3
GW-5	9/8/2004	mg/L	0.001 U	0.001 U	0.001 U	0.001 U	0.001 U	0.003 U
GW-5	5/27/2004	mg/L	0.001 U	0.001 U	0.001 U	0.001 U	0.001 U	0.003 U
GW-5	5/13/2005	mg/L	0.001 U	0.001 U	0.001 U	0.001 U	0.001 U	0.003
GW-6A	9/8/2004	mg/L	0.001 U	0.001 U	0.001 U	0.001 U	0.001 U	0.003 U
GW-6B	9/9/2004	mg/L	0.001 U	0.001 U	0.001 U	0.001 U	0.001 U	0.003 U
GW-6B	5/26/2004	mg/L	0.001 U	0.001 U	0.0063	0.001 U	0.001 U	0.003 U
GW-6B	5/13/2005	mg/L	0.001 U	0.001 U	0.001 U	0.001 U	0.001 U	0.003
GW-7	9/8/2004	mg/L	0.001 U	0.001 U	0.001 U	0.001 U	0.001 U	0.003 U
GW-7	5/26/2004	mg/L	0.001 U	0.001 U	0.001 U	0.001 U	0.001 U	0.003 U
GW-7	5/13/2005	mg/L	0.001 U	0.001 U	0.001 U	0.001 U	0.001 U	0.003
GW-8A	9/9/2004	mg/L	0.001 U	0.001 U	0.001 U	0.001 U	0.001 U	0.003 U
GW-8B	9/9/2004	mg/L	0.001 U	0.001 U	0.001 U	0.001 U	0.001 U	0.003 U
GW-8B	5/26/2004	mg/L	0.001 U	0.001 U	0.001 U	0.001 U	0.001 U	0.003 U
GW-8B	5/11/2005	mg/L	0.001 U	0.001 U	0.001 U	0.001 U	0.001 U	0.003
GW-8C	5/11/2005	mg/L	0.001 U	0.001 U	0.0029	0.001 U	0.0023	0.003
GW-9A	9/9/2004	mg/L	0.001 U	0.001 U	0.001 U	0.001 U	0.001 U	0.003 U
GW-9B	9/9/2004	mg/L	0.001 U	0.001 U	0.001 U	0.001 U	0.001 U	0.003 U
GW-9B	5/26/2004	mg/L	0.001 U	0.001 U	0.0024	0.001 U	0.001 U	0.003 U
GW-9B	5/11/2005	mg/L	0.001 U	0.001 U	0.001 U	0.001 U	0.001 U	0.003
GW-10A	9/9/2004	mg/L	0.001 U	0.001 U	0.001 U	0.001 U	0.001 U	0.003 U
GW-10B	9/9/2004	mg/L	0.001 U	0.001 U	0.001 U	0.001 U	0.0012	0.003 U
GW-10B	5/26/2004	mg/L	0.001 U	0.001 U	0.001 U	0.001 U	0.001 U	0.003 U
GW-10B	5/11/2005	mg/L	0.001 U	0.001 U	0.001 U	0.001 U	0.001 U	0.003
GW-10C	5/12/2005	mg/L	0.001 U	0.001 U	0.0025	0.001 U	0.0018	0.003
GW-11A	9/8/2004	mg/L	0.001 U	0.001 U	0.001 U	0.001 U	0.001 U	0.003 U
GW-11A	5/26/2004	mg/L	0.001 U	0.001 U	0.001 U	0.001 U	0.001 U	0.003 U
GW-11A	5/11/2005	mg/L	0.001 U	0.001 U	0.001 U	0.001 U	0.001 U	0.003
GW-11B	9/8/2004	mg/L	0.001 U	0.001 U	0.001 U	0.001 U	0.001 U	0.003 U
GW-11B	5/26/2004	mg/L	0.001 U	0.001 U	0.001 U	0.001 U	0.001 U	0.003 U
GW-11B	5/11/2005	mg/L	0.001 U	0.001 U	0.001 U	0.001 U	0.001 U	0.003
GW-11C	9/8/2004	mg/L	0.001 U	0.001 U	0.001 U	0.001 U	0.13	0.003 U
GW-11C	5/26/2004	mg/L	0.005 U	0.005 U	0.005 U	0.005 U	0.044	0.015 U
GW-11C	5/11/2005	mg/L	0.001 U	0.001 U	0.001 U	0.001 U	0.086	0.003
GW-12A	9/10/2004	mg/L	0.001 U	0.001 U	0.001 U	0.001 U	0.001 U	0.003 U
GW-12A	5/26/2004	mg/L	0.001 U	0.001 U	0.001 U	0.001 U	0.001 U	0.003 U
GW-12A	5/12/2005	mg/L	0.001 U	0.001 U	0.001 U	0.001 U	0.001 U	0.003
GW-12B	9/10/2004	mg/L	0.001 U	0.001 U	0.001 U	0.001 U	0.001 U	0.003 U
GW-12B	5/26/2004	mg/L	0.001 U	0.001 U	0.001 U	0.001 U	0.001 U	0.003 U
GW-12B	5/12/2005	mg/L	0.001 U	0.001 U	0.001 U	0.001 U	0.001 U	0.003
GW-12C	9/10/2004	mg/L	0.001 U	0.001 U	0.001 U	0.001 U	0.001 U	0.003 U
GW-12C	5/26/2004	mg/L	0.001 U	0.001 U	0.001 U	0.001 U	0.001 U	0.003 U
GW-12C	5/12/2005	mg/L	0.001 U	0.001 U	0.001 U	0.001 U	0.001 U	0.003
Number of Detects/Samples			0 47	0 47	4 47	0 47	6 47	15 47

J = Estimated value

U = UNDETECTED

mg/L = Milligrams per liter

Table C-2
SUMMARY OF SEMIVOLATILE ORGANIC COMPOUNDS IN GROUNDWATER
QUALITY ANALYTICAL SERVICES SITE
BLUE SUMMIT, MO

Well ID	Sample Date	2,4,5-TRICHLOROPHENOL mg/l	2,4,6-TRICHLOROPHENOL mg/l	2,4-DICHLOROPHENOL mg/l	2,4-DIMETHYLPHENOL mg/l	2,4-DINITROPHENOL mg/l	2,4-DINITROTOLUENE mg/l
GW-10A	9/9/2004 9:00	0.01 U	0.01 U	0.01 U	0.01 U	0.01 U	0.01 U
GW-10B	9/9/2004 8:30	0.01 U	0.01 U	0.01 U	0.01 U	0.01 U	0.01 U
GW-11C	9/8/2004 14:30	0.01 U	0.01 U	0.01 U	0.01 U	0.01 U	0.01 U
GW-12A	9/10/2004 11:20	0.01 U	0.01 U	0.01 U	0.01 U	0.01 U	0.01 U
GW-12B	9/10/2004 10:20	0.01 U	0.01 U	0.01 U	0.01 U	0.01 U	0.01 U
GW-12C	9/10/2004 11:00	0.01 U	0.01 U	0.01 U	0.01 U	0.01 U	0.01 U
GW-8A	9/9/2004 11:00	0.01 U	0.01 U	0.01 U	0.01 U	0.01 U	0.01 U
GW-8B	9/9/2004 11:20	0.01 U	0.01 U	0.01 U	0.01 U	0.01 U	0.01 U
GW-9A	9/9/2004 10:00	0.01 U	0.01 U	0.01 U	0.01 U	0.01 U	0.01 U
GW-9B	9/9/2004 9:40	0.01 U	0.01 U	0.01 U	0.01 U	0.01 U	0.01 U

mg/L = Milligrams per liter

U = UNDETECTED

Table C-2
SUMMARY OF SEMIVOLATILE ORGANIC COMPOUNDS IN GROUNDWATER
QUALITY ANALYTICAL SERVICES SITE
BLUE SUMMIT, MO

Well ID	Sample Date	2,6-DINITROTOLUENE mg/l	2-CHLORONAPHTHALENE mg/l	2-CHLOROPHENOL mg/l	2-METHYLNAPHTHALENE mg/l	2-NITROANILINE mg/l	2-NITROPHENOL mg/l	3,3-DICHLOROBENZIDINE mg/l
GW-10A	9/9/2004 9:00	0.01 U	0.01 U	0.01 U	0.01 U	0.01 U	0.01 U	0.01
GW-10B	9/9/2004 8:30	0.01 U	0.01 U	0.01 U	0.01 U	0.01 U	0.01 U	0.01
GW-11C	9/8/2004 14:30	0.01 U	0.01 U	0.01 U	0.01 U	0.01 U	0.01 U	0.01
GW-12A	9/10/2004 11:20	0.01 U	0.01 U	0.01 U	0.01 U	0.01 U	0.01 U	0.01
GW-12B	9/10/2004 10:20	0.01 U	0.01 U	0.01 U	0.01 U	0.01 U	0.01 U	0.01
GW-12C	9/10/2004 11:00	0.01 U	0.01 U	0.01 U	0.01 U	0.01 U	0.01 U	0.01
GW-8A	9/9/2004 11:00	0.01 U	0.01 U	0.01 U	0.01 U	0.01 U	0.01 U	0.01
GW-8B	9/9/2004 11:20	0.01 U	0.01 U	0.01 U	0.01 U	0.01 U	0.01 U	0.01
GW-9A	9/9/2004 10:00	0.01 U	0.01 U	0.01 U	0.01 U	0.01 U	0.01 U	0.01
GW-9B	9/9/2004 9:40	0.01 U	0.01 U	0.01 U	0.01 U	0.01 U	0.01 U	0.01

mg/L = Milligrams per liter

U = UNDETECTED

Table C-2
SUMMARY OF SEMIVOLATILE ORGANIC COMPOUNDS IN GROUNDWATER
QUALITY ANALYTICAL SERVICES SITE
BLUE SUMMIT, MO

Well ID	Sample Date	3-NITROANILINE mg/l	4,6-DINITRO-2-METHYLPHENOL mg/l	4-BROMOPHENYL-PHENYLETHER mg/l	4-CHLORO-3-METHYLPHENOL mg/l	4-CHLOROPHENYL-PHENYLETHER mg/l
GW-10A	9/9/2004 9:00	U	0.01 U	0.01 U	0.01 U	0.01 U
GW-10B	9/9/2004 8:30	U	0.01 U	0.01 U	0.01 U	0.01 U
GW-11C	9/8/2004 14:30	U	0.01 U	0.01 U	0.01 U	0.01 U
GW-12A	9/10/2004 11:20	U	0.01 U	0.01 U	0.01 U	0.01 U
GW-12B	9/10/2004 10:20	U	0.01 U	0.01 U	0.01 U	0.01 U
GW-12C	9/10/2004 11:00	U	0.01 U	0.01 U	0.01 U	0.01 U
GW-8A	9/9/2004 11:00	U	0.01 U	0.01 U	0.01 U	0.01 U
GW-8B	9/9/2004 11:20	U	0.01 U	0.01 U	0.01 U	0.01 U
GW-9A	9/9/2004 10:00	U	0.01 U	0.01 U	0.01 U	0.01 U
GW-9B	9/9/2004 9:40	U	0.01 U	0.01 U	0.01 U	0.01 U

mg/L = Milligrams per liter

U = UNDETECTED

Table C-2
SUMMARY OF SEMIVOLATILE ORGANIC COMPOUNDS IN GROUNDWATER
QUALITY ANALYTICAL SERVICES SITE
BLUE SUMMIT, MO

Well ID	Sample Date	4-NITROANILINE mg/l	4-NITROPHENOL mg/l	ACENAPHTHENE mg/l	ACENAPHTHYLENE mg/l	ANTHRACENE mg/l	BENZIDINE mg/l	BENZO(A)ANTHRACENE mg/l	BENZO(A)PYRENE mg/l
GW-10A	9/9/2004 9:00	0.01 U	0.01 U	0.01 U	0.01 U	0.01 U	0.05 U	0.01 U	0.01 U
GW-10B	9/9/2004 8:30	0.01 U	0.01 U	0.01 U	0.01 U	0.01 U	0.05 U	0.01 U	0.01 U
GW-11C	9/8/2004 14:30	0.01 U	0.01 U	0.01 U	0.01 U	0.01 U	0.05 U	0.01 U	0.01 U
GW-12A	9/10/2004 11:20	0.01 U	0.01 U	0.01 U	0.01 U	0.01 U	0.05 U	0.01 U	0.01 U
GW-12B	9/10/2004 10:20	0.01 U	0.01 U	0.01 U	0.01 U	0.01 U	0.05 U	0.01 U	0.01 U
GW-12C	9/10/2004 11:00	0.01 U	0.01 U	0.01 U	0.01 U	0.01 U	0.05 U	0.01 U	0.01 U
GW-8A	9/9/2004 11:00	0.01 U	0.01 U	0.01 U	0.01 U	0.01 U	0.05 U	0.01 U	0.01 U
GW-8B	9/9/2004 11:20	0.01 U	0.01 U	0.01 U	0.01 U	0.01 U	0.05 U	0.01 U	0.01 U
GW-9A	9/9/2004 10:00	0.01 U	0.01 U	0.01 U	0.01 U	0.01 U	0.05 U	0.01 U	0.01 U
GW-9B	9/9/2004 9:40	0.01 U	0.01 U	0.01 U	0.01 U	0.01 U	0.05 U	0.01 U	0.01 U

mg/L = Milligrams per liter

U = UNDETECTED

Table C-2
SUMMARY OF SEMIVOLATILE ORGANIC COMPOUNDS IN GROUNDWATER
QUALITY ANALYTICAL SERVICES SITE
BLUE SUMMIT, MO

Well ID	Sample Date	BENZO(B)FLUORANTHENE mg/l	BENZO(G,H,I)PERYLENE mg/l	BENZO(K)FLUORANTHENE mg/l	BENZOIC ACID mg/l	BENZYL ALCOHOL mg/l	BENZYL BUTYL PHTHALATE mg/l
GW-10A	9/9/2004 9:00	0.01 U	0.01 U	0.01 U	0.01 U	0.01 U	0.01 U
GW-10B	9/9/2004 8:30	0.01 U	0.01 U	0.01 U	0.01 U	0.01 U	0.01 U
GW-11C	9/8/2004 14:30	0.01 U	0.01 U	0.01 U	0.01 U	0.01 U	0.01 U
GW-12A	9/10/2004 11:20	0.01 U	0.01 U	0.01 U	0.01 U	0.01 U	0.01 U
GW-12B	9/10/2004 10:20	0.01 U	0.01 U	0.01 U	0.01 U	0.01 U	0.01 U
GW-12C	9/10/2004 11:00	0.01 U	0.01 U	0.01 U	0.01 U	0.01 U	0.01 U
GW-8A	9/9/2004 11:00	0.01 U	0.01 U	0.01 U	0.01 U	0.01 U	0.01 U
GW-8B	9/9/2004 11:20	0.01 U	0.01 U	0.01 U	0.01 U	0.01 U	0.01 U
GW-9A	9/9/2004 10:00	0.01 U	0.01 U	0.01 U	0.01 U	0.01 U	0.01 U
GW-9B	9/9/2004 9:40	0.01 U	0.01 U	0.01 U	0.01 U	0.01 U	0.01 U

mg/L = Milligrams per liter

U = UNDETECTED

Table C-2
SUMMARY OF SEMIVOLATILE ORGANIC COMPOUNDS IN GROUNDWATER
QUALITY ANALYTICAL SERVICES SITE
BLUE SUMMIT, MO

Well ID	Sample Date	BIS(2-CHLORETHOXY)METHANE	BIS(2-CHLOROETHYL)ETHER	BIS(2-CHLOROISOPROPYL)ETHER	BIS(2-ETHYLHEXYL)PHTHALATE	CHRYSENE
		mg/l	mg/l	mg/l	mg/l	mg/l
GW-10A	9/9/2004 9:00	0.01 U	0.01 U	0.01 U	0.01 U	0.01 U
GW-10B	9/9/2004 8:30	0.01 U	0.01 U	0.01 U	0.01 U	0.01 U
GW-11C	9/8/2004 14:30	0.01 U	0.01 U	0.01 U	0.01 U	0.01 U
GW-12A	9/10/2004 11:20	0.01 U	0.01 U	0.01 U	0.01 U	0.01 U
GW-12B	9/10/2004 10:20	0.01 U	0.01 U	0.01 U	0.01 U	0.01 U
GW-12C	9/10/2004 11:00	0.01 U	0.01 U	0.01 U	0.01 U	0.01 U
GW-8A	9/9/2004 11:00	0.01 U	0.01 U	0.01 U	0.01 U	0.01 U
GW-8B	9/9/2004 11:20	0.01 U	0.01 U	0.01 U	0.01 U	0.01 U
GW-9A	9/9/2004 10:00	0.01 U	0.01 U	0.01 U	0.01 U	0.01 U
GW-9B	9/9/2004 9:40	0.01 U	0.01 U	0.01 U	0.01 U	0.01 U

mg/L = Milligrams per liter

U = UNDETECTED

Table C-2
SUMMARY OF SEMIVOLATILE ORGANIC COMPOUNDS IN GROUNDWATER
QUALITY ANALYTICAL SERVICES SITE
BLUE SUMMIT, MO

Well ID	Sample Date	DIBENZ(A,H)ANTHRACENE mg/l	DIETHYL PHTHALATE mg/l	DIMETHYL PHTHALATE mg/l	DI-N-BUTYL PHTHALATE mg/l	DI-N-OCTYL PHTHALATE mg/l	FLUORANTHENE mg/l	FLUORENE mg/l
GW-10A	9/9/2004 9:00	0.01 U	0.01 U	0.01 U	0.01 U	0.01 U	0.01 U	0.01
GW-10B	9/9/2004 8:30	0.01 U	0.01 U	0.01 U	0.01 U	0.01 U	0.01 U	0.01
GW-11C	9/8/2004 14:30	0.01 U	0.01 U	0.01 U	0.01 U	0.01 U	0.01 U	0.01
GW-12A	9/10/2004 11:20	0.01 U	0.01 U	0.01 U	0.01 U	0.01 U	0.01 U	0.01
GW-12B	9/10/2004 10:20	0.01 U	0.01 U	0.01 U	0.01 U	0.01 U	0.01 U	0.01
GW-12C	9/10/2004 11:00	0.01 U	0.01 U	0.01 U	0.01 U	0.01 U	0.01 U	0.01
GW-8A	9/9/2004 11:00	0.01 U	0.01 U	0.01 U	0.01 U	0.01 U	0.01 U	0.01
GW-8B	9/9/2004 11:20	0.01 U	0.01 U	0.01 U	0.01 U	0.01 U	0.01 U	0.01
GW-9A	9/9/2004 10:00	0.01 U	0.01 U	0.01 U	0.01 U	0.01 U	0.01 U	0.01
GW-9B	9/9/2004 9:40	0.01 U	0.01 U	0.01 U	0.01 U	0.01 U	0.01 U	0.01

mg/L = Milligrams per liter

U = UNDETECTED

Table C-2
SUMMARY OF SEMIVOLATILE ORGANIC COMPOUNDS IN GROUNDWATER
QUALITY ANALYTICAL SERVICES SITE
BLUE SUMMIT, MO

Well ID	Sample Date	HEXACHLORO-1,3-BUTADIENE		HEXACHLOROBENZENE		HEXACHLOROCYCLOPENTADIENE		HEXACHLOROETHANE		INDENO(1,2,3-CD)PYRENE		ISOPHORONE	
		mg/l		mg/l		mg/l		mg/l		mg/l		mg/l	
GW-10A	9/9/2004 9:00	U	0.01	U	0.01	U	0.01	U	0.01	U	0.01	U	0.01
GW-10B	9/9/2004 8:30	U	0.01	U	0.01	U	0.01	U	0.01	U	0.01	U	0.01
GW-11C	9/8/2004 14:30	U	0.01	U	0.01	U	0.01	U	0.01	U	0.01	U	0.01
GW-12A	9/10/2004 11:20	U	0.01	U	0.01	U	0.01	U	0.01	U	0.01	U	0.01
GW-12B	9/10/2004 10:20	U	0.01	U	0.01	U	0.01	U	0.01	U	0.01	U	0.01
GW-12C	9/10/2004 11:00	U	0.01	U	0.01	U	0.01	U	0.01	U	0.01	U	0.01
GW-8A	9/9/2004 11:00	U	0.01	U	0.01	U	0.01	U	0.01	U	0.01	U	0.01
GW-8B	9/9/2004 11:20	U	0.01	U	0.01	U	0.01	U	0.01	U	0.01	U	0.01
GW-9A	9/9/2004 10:00	U	0.01	U	0.01	U	0.01	U	0.01	U	0.01	U	0.01
GW-9B	9/9/2004 9:40	U	0.01	U	0.01	U	0.01	U	0.01	U	0.01	U	0.01

mg/L = Milligrams per liter

U = UNDETECTED

Table C-2
SUMMARY OF SEMIVOLATILE ORGANIC COMPOUNDS IN GROUNDWATER
QUALITY ANALYTICAL SERVICES SITE
BLUE SUMMIT, MO

Well ID	Sample Date	NITROBENZENE mg/l	N-NITROSODIMETHYLAMINE mg/l	N-NITROSODI-N-PROPYLAMINE mg/l	N-NITROSODIPHENYLAMINE mg/l	PENTACHLOROPHENOL mg/l	PHENANTHRENE mg/l
GW-10A	9/9/2004 9:00	U	0.01 U	0.01 U	0.01 U	0.01 U	0.01 U
GW-10B	9/9/2004 8:30	U	0.01 U	0.01 U	0.01 U	0.01 U	0.01 U
GW-11C	9/8/2004 14:30	U	0.01 U	0.01 U	0.01 U	0.01 U	0.01 U
GW-12A	9/10/2004 11:20	U	0.01 U	0.01 U	0.01 U	0.01 U	0.01 U
GW-12B	9/10/2004 10:20	U	0.01 U	0.01 U	0.01 U	0.01 U	0.01 U
GW-12C	9/10/2004 11:00	U	0.01 U	0.01 U	0.01 U	0.01 U	0.01 U
GW-8A	9/9/2004 11:00	U	0.01 U	0.01 U	0.01 U	0.01 U	0.01 U
GW-8B	9/9/2004 11:20	U	0.01 U	0.01 U	0.01 U	0.01 U	0.01 U
GW-9A	9/9/2004 10:00	U	0.01 U	0.01 U	0.01 U	0.01 U	0.01 U
GW-9B	9/9/2004 9:40	U	0.01 U	0.01 U	0.01 U	0.01 U	0.01 U

mg/L = Milligrams per liter

U = UNDETECTED

Table C-2
SUMMARY OF SEMIVOLATILE ORGANIC COMPOUNDS IN GROUNDWATER
QUALITY ANALYTICAL SERVICES SITE
BLUE SUMMIT, MO

Well ID	Sample Date	PHENOL mg/l	PYRENE mg/l
GW-10A	9/9/2004 9:00	0.01 U	0.01 U
GW-10B	9/9/2004 8:30	0.01 U	0.01 U
GW-11C	9/8/2004 14:30	0.01 U	0.01 U
GW-12A	9/10/2004 11:20	0.01 U	0.01 U
GW-12B	9/10/2004 10:20	0.01 U	0.01 U
GW-12C	9/10/2004 11:00	0.01 U	0.01 U
GW-8A	9/9/2004 11:00	0.01 U	0.01 U
GW-8B	9/9/2004 11:20	0.01 U	0.01 U
GW-9A	9/9/2004 10:00	0.01 U	0.01 U
GW-9B	9/9/2004 9:40	0.01 U	0.01 U

mg/L = Milligrams per liter

U = UNDETECTED

Table C-3
SUMMARY OF PESTICIDES/PCBs IN GROUNDWATER
QUALITY ANALYTICAL SERVICES SITE
BLUE SUMMIT, MO

Well ID	Sample Date	4,4-DDD mg/l	4,4-DDE mg/l	4,4-DDT mg/l	ALDRIN mg/l	ALPHA BHC mg/l	BETA BHC mg/l	DELTA BHC mg/l	DIELDRIN mg/l	ENDOSULFAN I mg/l	ENDOSULFAN II mg/l
GW-10A	9/9/2004 9:00	0.0005 U	0.0005 U	0.0005 U	0.0005 U	0.0005 U	0.0005 U	0.0005 U	0.0005 U	0.0005 U	0.0005 U
GW-10B	9/9/2004 8:30	0.0005 U	0.0005 U	0.0005 U	0.0005 U	0.0005 U	0.0005 U	0.0005 U	0.0005 U	0.0005 U	0.0005 U
GW-11C	9/8/2004 14:30	0.0005 U	0.0005 U	0.0005 U	0.0005 U	0.0005 U	0.0005 U	0.0005 U	0.0005 U	0.0005 U	0.0005 U
GW-12A	9/10/2004 11:20	0.0005 U	0.0005 U	0.0005 U	0.0005 U	0.0005 U	0.0005 U	0.0005 U	0.0005 U	0.0005 U	0.0005 U
GW-12B	9/10/2004 10:20	0.0005 U	0.0005 U	0.0005 U	0.0005 U	0.0005 U	0.0005 U	0.0005 U	0.0005 U	0.0005 U	0.0005 U
GW-12C	9/10/2004 11:00	0.0005 U	0.0005 U	0.0005 U	0.0005 U	0.0005 U	0.0005 U	0.0005 U	0.0005 U	0.0005 U	0.0005 U
GW-8A	9/9/2004 11:00	0.0005 U	0.0005 U	0.0005 U	0.0005 U	0.0005 U	0.0005 U	0.0005 U	0.0005 U	0.0005 U	0.0005 U
GW-8B	9/9/2004 11:20	0.0005 U	0.0005 U	0.0005 U	0.0005 U	0.0005 U	0.0005 U	0.0005 U	0.0005 U	0.0005 U	0.0005 U
GW-9A	9/9/2004 10:00	0.0005 U	0.0005 U	0.0005 U	0.0005 U	0.0005 U	0.0005 U	0.0005 U	0.0005 U	0.0005 U	0.0005 U
GW-9B	9/9/2004 9:40	0.0005 U	0.0005 U	0.0005 U	0.0005 U	0.0005 U	0.0005 U	0.0005 U	0.0005 U	0.0005 U	0.0005 U

mg/L = Milligrams per liter

U = UNDETECTED

Table C-3
SUMMARY OF PESTICIDES/PCBs IN GROUNDWATER
QUALITY ANALYTICAL SERVICES SITE
BLUE SUMMIT, MO

Well ID	Sample Date	ENDOSULFAN SULFATE mg/l	ENDRIN mg/l	ENDRIN ALDEHYDE mg/l	ENDRIN KETONE mg/l	GAMMA BHC mg/l	HEPTACHLOR mg/l	HEPTACHLOR EPOXIDE mg/l
GW-10A	9/9/2004 9:00	0.0005 U	0.0005 U	0.0005 U	0.0005 U	0.0005 U	0.0005 U	0.0005 U
GW-10B	9/9/2004 8:30	0.0005 U	0.0005 U	0.0005 U	0.0005 U	0.0005 U	0.0005 U	0.0005 U
GW-11C	9/8/2004 14:30	0.0005 U	0.0005 U	0.0005 U	0.0005 U	0.0005 U	0.0005 U	0.0005 U
GW-12A	9/10/2004 11:20	0.0005 U	0.0005 U	0.0005 U	0.0005 U	0.0005 U	0.0005 U	0.0005 U
GW-12B	9/10/2004 10:20	0.0005 U	0.0005 U	0.0005 U	0.0005 U	0.0005 U	0.0005 U	0.0005 U
GW-12C	9/10/2004 11:00	0.0005 U	0.0005 U	0.0005 U	0.0005 U	0.0005 U	0.0005 U	0.0005 U
GW-8A	9/9/2004 11:00	0.0005 U	0.0005 U	0.0005 U	0.0005 U	0.0005 U	0.0005 U	0.0005 U
GW-8B	9/9/2004 11:20	0.0005 U	0.0005 U	0.0005 U	0.0005 U	0.0005 U	0.0005 U	0.0005 U
GW-9A	9/9/2004 10:00	0.0005 U	0.0005 U	0.0005 U	0.0005 U	0.0005 U	0.0005 U	0.0005 U
GW-9B	9/9/2004 9:40	0.0005 U	0.0005 U	0.0005 U	0.0005 U	0.0005 U	0.0005 U	0.0005 U

mg/L = Milligrams per liter
U = UNDETECTED

Table C-3
SUMMARY OF PESTICIDES/PCBs IN GROUNDWATER
QUALITY ANALYTICAL SERVICES SITE
BLUE SUMMIT, MO

Well ID	Sample Date	METHOXYCHLOR mg/l	PCB 1016 mg/l	PCB 1221 mg/l	PCB 1232 mg/l	PCB 1242 mg/l	PCB 1248 mg/l	PCB 1254 mg/l	PCB 1260 mg/l
GW-10A	9/9/2004 9:00	0.0005 U	0.0005 U	0.0005 U	0.0005 U	0.0005 U	0.0005 U	0.0005 U	0.0005 U
GW-10B	9/9/2004 8:30	0.0005 U	0.0005 U	0.0005 U	0.0005 U	0.0005 U	0.0005 U	0.0005 U	0.0005 U
GW-11C	9/8/2004 14:30	0.0005 U	0.0005 U	0.0005 U	0.0005 U	0.0005 U	0.0005 U	0.0005 U	0.0005 U
GW-12A	9/10/2004 11:20	0.0005 U	0.0005 U	0.0005 U	0.0005 U	0.0005 U	0.0005 U	0.0005 U	0.0005 U
GW-12B	9/10/2004 10:20	0.0005 U	0.0005 U	0.0005 U	0.0005 U	0.0005 U	0.0005 U	0.0005 U	0.0005 U
GW-12C	9/10/2004 11:00	0.0005 U	0.0005 U	0.0005 U	0.0005 U	0.0005 U	0.0005 U	0.0005 U	0.0005 U
GW-8A	9/9/2004 11:00	0.0005 U	0.0005 U	0.0005 U	0.0005 U	0.0005 U	0.0005 U	0.0005 U	0.0005 U
GW-8B	9/9/2004 11:20	0.0005 U	0.0005 U	0.0005 U	0.0005 U	0.0005 U	0.0005 U	0.0005 U	0.0005 U
GW-9A	9/9/2004 10:00	0.0005 U	0.0005 U	0.0005 U	0.0005 U	0.0005 U	0.0005 U	0.0005 U	0.0005 U
GW-9B	9/9/2004 9:40	0.0005 U	0.0005 U	0.0005 U	0.0005 U	0.0005 U	0.0005 U	0.0005 U	0.0005 U

mg/L = Milligrams per liter
U = UNDETECTED

Table 4
SUMMARY OF METALS IN GROUNDWATER (05/2004 -05/2005)
QUALITY ANALYTICAL SERVICES SITE
BLUE SUMMIT, MO

Well ID	Sample Date	ARSENIC mg/l	ARSENIC,D mg/l	BARIUM mg/l	BARIUM,D mg/l	CADMIUM mg/l	CADMIUM,D mg/l	CHROMIUM mg/l	CHROMIUM,D mg/l	CHROMIUM,HEX mg/l	LEAD mg/l	LEAD,D mg/l
GW-1	5/27/2004 11:45	0.01 U	0.01 U	0.072	0.071	0.005 U	0.005 U	0.01 U	0.01 U		0.0068	0.005 U
GW-1	9/8/2004 9:28	0.01 U		0.086		0.005 U		0.01 U			0.005 U	
GW-1	5/13/2005 10:30	0.02 U	0.02 U	0.1	0.093	0.005 U	0.005 U	0.01 U	0.01 U		0.018	0.005 U
GW-2R	9/8/2004 10:45	0.012		0.63		0.005 U		0.01 U			0.012	
GW-3	9/8/2004 0:00	0.24		0.41		0.005 U		0.01 U			0.011	
GW-5	5/27/2004 0:00	0.01 U	0.01 U	0.18	0.13	0.0059	0.005 U	0.012	0.01 U		0.0068	0.005 U
GW-5	9/8/2004 9:55	0.01 U		0.3		0.005 U		0.027			0.015	
GW-5	5/13/2005 11:00	0.02 U	0.02 U	0.6	0.13	0.0086	0.005 U	0.1	0.01 U		0.045	0.005 U
GW-6A	9/8/2004 14:50	0.01 U		0.32		0.005 U		0.03			0.021	
GW-6B	5/26/2004 10:30	0.01 U	0.01 U	0.6	0.35	0.005 U	0.005 U	0.01 U	0.01 U		0.005 U	0.005 U
GW-6B	9/9/2004 13:50	0.019		1.7		0.005 U		0.01 U			0.058	
GW-6B	5/13/2005 9:30	0.02 U	0.02 U	0.65	0.31	0.005 U	0.005 U	0.01 U	0.01 U		0.005 U	0.005 U
GW-7	5/26/2004 10:34	0.01 U	0.01 U	0.25	0.1	0.011	0.005 U	0.018	0.01 U		0.016	0.005 U
GW-7	9/8/2004 12:45	0.01 U		0.35		0.005 U		0.033			0.028	
GW-7	5/13/2005 10:00	0.02 U	0.02 U	0.29	0.072	0.005 U	0.005 U	0.033	0.01 U		0.031	0.005 U
GW-8A	9/9/2004 11:00	0.014		0.62		0.005 U		0.026		0.01 U	0.03	
GW-8B	5/26/2004 16:00	0.01 U	0.01 U	0.4	0.36	0.005 U	0.005 U	0.01 U	0.01 U		0.0086	0.005 U
GW-8B	9/9/2004 11:20	0.065		1		0.005 U		0.025		0.01 U	0.045	
GW-8B	5/11/2005 15:30	0.021	0.02 U	1.1	0.34	0.005 U	0.005 U	0.062	0.01 U		0.076	0.005 U
GW-8C	5/11/2005 12:15	0.02 U	0.02 U	0.73	0.58	0.005 U	0.005 U	0.018	0.01 U		0.0067	0.0054
GW-9A	9/9/2004 10:00	0.025		0.5		0.005 U		0.01 U		0.01 U	0.012	
GW-9B	5/26/2004 16:30	0.014	0.01 U	0.3	0.19	0.005 U	0.005 U	0.01 U	0.01 U		0.012	0.005 U
GW-9B	9/9/2004 9:40	0.011		0.53		0.005 U		0.03		0.01 U	0.03	
GW-9B	5/11/2005 12:00	0.02 U	0.02 U	0.56	0.26	0.005 U	0.005 U	0.012	0.01 U		0.011	0.005 U
GW-10A	9/9/2004 9:00	0.018		0.51		0.005 U		0.085		0.01 U	0.085	
GW-10B	5/26/2004 15:00	0.042	0.01 U	0.38	0.2	0.005 U	0.005 U	0.01 U	0.01 U		0.005 U	0.005 U
GW-10B	9/9/2004 8:30	0.025		0.54		0.005 U		0.01 U		0.01 U	0.0066	
GW-10B	5/11/2005 16:00	0.023	0.02 U	0.46	0.25	0.005 U	0.005 U	0.01 U	0.01 U		0.005 U	0.005 U
GW-10C	5/12/2005 11:30	0.05	0.02 U	3.1	0.63	0.025	0.005 U	0.36	0.01 U		0.13	0.0089
GW-11A	5/26/2004 11:00	0.012	0.01 U	0.53	0.12	0.0078	0.005 U	0.042	0.01 U		0.022	0.005 U
GW-11A	9/8/2004 13:30	0.01 U		0.7		0.005 U		0.072			0.037	
GW-11A	5/11/2005 9:25	0.02 U	0.02 U	1.5	0.25	0.014	0.005 U	0.18	0.01 U		0.059	0.005 U
GW-11B	5/26/2004 12:00	0.026	0.01 U	0.37	0.27	0.005 U	0.005 U	0.01 U	0.01 U		0.005 U	0.005 U
GW-11B	9/8/2004 14:15	0.022		0.6		0.005 U		0.044			0.03	
GW-11B	5/11/2005 10:25	0.02 U	0.02 U	0.46	0.12	0.005 U	0.005 U	0.024	0.01 U		0.0087	0.005 U
GW-11C	5/26/2004 11:30	0.01 U	0.01 U	0.6	0.54	0.005 U	0.005 U	0.01 U	0.01 U		0.005 U	0.005 U
GW-11C	9/8/2004 14:30	0.01 U		0.64		0.005 U		0.01 U		0.01 U	0.005 U	
GW-11C	5/11/2005 10:45	0.02 U	0.02 U	0.75	0.6	0.005 U	0.005 U	0.012	0.01 U		0.011	0.005 U
GW-12A	5/26/2004 13:30	0.01 U	0.01 U	0.16	0.15	0.005 U	0.005 U	0.01 U	0.01 U		0.005 U	0.005 U
GW-12A	9/10/2004 11:20	0.065		2.3		0.014		0.17		0.01 U	0.19	
GW-12A	5/12/2005 14:50	0.09 U	0.02 U	4.6	0.18	0.048	0.005 U	0.7	0.01 U		0.56	0.005 U
GW-12B	5/26/2004 14:30	0.01 U	0.01 U	0.68	0.43	0.005 U	0.005 U	0.01 U	0.01 U		0.005 U	0.005 U
GW-12B	9/10/2004 10:20	0.088		0.92		0.014		0.14		0.01 U	0.086	
GW-12B	5/12/2005 14:00	0.02 U	0.02 U	0.41	0.2	0.005 U	0.005 U	0.01 U	0.01 U		0.005 U	0.005 U
GW-12C	5/26/2004 14:00	0.01 U	0.01 U	0.83	0.63	0.005 U	0.005 U	0.01 U	0.01 U		0.005 U	0.005 U
GW-12C	9/10/2004 11:00	0.01 U		0.94 J6		0.005 U		0.012		0.01 U	0.011	
GW-12C	5/12/2005 16:30	0.02 U	0.02 U	0.9	0.72	0.005 U	0.005 U	0.016	0.01 U		0.0088	0.005 U

mg/L = Milligrams per liter

J = Estimated value

U = UNDETECTED

Table C-4
SUMMARY OF METALS IN GROUNDWATER (05/2004 -05/2005)
QUALITY ANALYTICAL SERVICES SITE
BLUE SUMMIT, MO

Well ID	Sample Date	MANGANESE mg/l	MANGANESE,D mg/l	MERCURY mg/l	MERCURY,D mg/l	NICKEL mg/l	NICKEL,D mg/l	SELENIUM mg/l	SELENIUM,D mg/l	SILVER mg/l	SILVER, D mg/l
GW-1	5/27/2004 11:45	0.21	0.21	0.0002 U	0.0002 U	0.01 U	0.01 U	0.01 U	0.01 U	0.005 U	0.005 U
GW-1	9/8/2004 9:28	0.17		0.0002 U		0.01 U		0.01 U		0.005 U	
GW-1	5/13/2005 10:30	0.31	0.27	0.0002 U	0.0002 U	0.02 U	0.02 U	0.031	0.031	0.01 U	0.01 U
GW-2R	9/8/2004 10:45	4.5		0.0002 U		0.086		0.01 U		0.005 U	
GW-3	9/8/2004 0:00	3		0.0002 U		0.17		0.01 U		0.005 U	
GW-5	5/27/2004 0:00	0.093	0.01 U	0.0002 U	0.0002 U	0.01 U	0.01 U	0.01 U	0.01 U	0.005 U	0.005 U
GW-5	9/8/2004 9:55	0.32		0.0002 U		0.04		0.01 U		0.005 U	
GW-5	5/13/2005 11:00	0.39	0.01 U	0.0002 U	0.0002 U	0.033	0.02 U	0.02 U	0.02 U	0.01 U	0.01 U
GW-6A	9/8/2004 14:50	0.27		0.0002 U		0.036		0.01		0.005 U	
GW-6B	5/26/2004 10:30	0.17	0.01	0.0002 U	0.0002 U	0.047	0.036	0.01 U	0.01 U	0.005 U	0.005 U
GW-6B	9/9/2004 13:50	0.7		0.0002 U		0.01 U		0.01 U		0.005 U	
GW-6B	5/13/2005 9:30	0.43	0.3	0.0002 U	0.0002 U	0.02 U	0.02 U	0.02 U	0.02 U	0.01 U	0.01 U
GW-7	5/26/2004 10:34	2	0.01 U	0.0002 U	0.0002 U	0.01	0.01 U	0.01 U	0.01 U	0.005 U	0.005 U
GW-7	9/8/2004 12:45	4.4		0.0002 U		0.052		0.012		0.005 U	
GW-7	5/13/2005 10:00	3.4	0.01 U	0.0002 U	0.0002 U	0.021	0.02 U	0.02 U	0.02 U	0.01 U	0.01 U
GW-8A	9/9/2004 11:00	1.9		0.0002 U		0.057		0.01		0.005 U	
GW-8B	5/26/2004 16:00	0.98	0.089	0.0002 U	0.0002 U	0.01 U	0.01 U	0.01 U	0.01 U	0.005 U	0.005 U
GW-8B	9/9/2004 11:20	1.1		0.0002 U		0.011		0.013		0.005 U	
GW-8B	5/11/2005 15:30	1.5	0.6	0.0002 U	0.0002 U	0.02 U	0.02 U	0.034	0.03	0.01 U	0.01 U
GW-8C	5/11/2005 12:15	0.98	0.91	0.0002 U	0.0002 U	0.02 U	0.02 U	0.02 U	0.02 U	0.01 U	0.01 U
GW-9A	9/9/2004 10:00	0.39		0.0002 U		0.01 U		0.01 U		0.005 U	
GW-9B	5/26/2004 16:30	2.3	0.01 U	0.0002 U	0.0002 U	0.012	0.01 U	0.01 U	0.01 U	0.005 U	0.005 U
GW-9B	9/9/2004 9:40	0.36		0.0002 U		0.021		0.016		0.005 U	
GW-9B	5/11/2005 12:00	0.58	0.28	0.0002 U	0.0002 U	0.02 U	0.02 U	0.02 U	0.02 U	0.01 U	0.01 U
GW-10A	9/9/2004 9:00	0.82		0.0002 U		0.04		0.01 U		0.005 U	
GW-10B	5/26/2004 15:00	0.47	0.46	0.0002 U	0.0002 U	0.01 U	0.01 U	0.01 U	0.01 U	0.005 U	0.005 U
GW-10B	9/9/2004 8:30	0.43		0.0002 U		0.01 U		0.01 U		0.005 U	
GW-10B	5/11/2005 16:00	0.32	0.26	0.0002 U	0.0002 U	0.02 U	0.02 U	0.042	0.041	0.01 U	0.01 U
GW-10C	5/12/2005 11:30	16	2.6	0.00043	0.0002 U	0.2	0.02 U	0.02 U	0.02 U	0.01 U	0.01 U
GW-11A	5/26/2004 11:00	0.41	0.01 U	0.0002 U	0.0002 U	0.028	0.01 U	0.01 U	0.01 U	0.005 U	0.005 U
GW-11A	9/8/2004 13:30	0.63		0.0002 U		0.084		0.01 U		0.005 U	
GW-11A	5/11/2005 9:25	1	0.19	0.0002 U	0.0002 U	0.051	0.02 U	0.034	0.02 U	0.01 U	0.01 U
GW-11B	5/26/2004 12:00	0.31	0.3	0.0002 U	0.0002 U	0.01 U	0.01 U	0.01 U	0.01 U	0.005 U	0.005 U
GW-11B	9/8/2004 14:15	0.8		0.0002 U		0.053		0.01 U		0.005 U	
GW-11B	5/11/2005 10:25	0.35	0.01 U	0.0002 U	0.0002 U	0.02 U	0.02 U	0.02	0.02 U	0.01 U	0.01 U
GW-11C	5/26/2004 11:30	0.84	0.82	0.0002 U	0.0002 U	0.01 U	0.01 U	0.01 U	0.01 U	0.005 U	0.005 U
GW-11C	9/8/2004 14:30	0.91		0.0002 U		0.026		0.01 U		0.005 U	
GW-11C	5/11/2005 10:45	1.3	0.84	0.0002 U	0.0002 U	0.03	0.02 U	0.02 U	0.02 U	0.01 U	0.01 U
GW-12A	5/26/2004 13:30	8.1	7.9	0.0002 U	0.0002 U	0.01 U	0.01 U	0.03	0.01 U	0.005 U	0.005 U
GW-12A	9/10/2004 11:20	9.1		0.00054		0.28		0.013		0.0056	
GW-12A	5/12/2005 14:50	25	7	0.00094	0.0002 U	0.57	0.02 U	0.09 U	0.048	0.045 U	0.01 U
GW-12B	5/26/2004 14:30	1.6	1	0.0002 U	0.0002 U	0.01 U	0.01 U	0.01 U	0.01 U	0.005 U	0.005 U
GW-12B	9/10/2004 10:20	2.4		0.0002 U		0.12		0.01 U		0.005 U	
GW-12B	5/12/2005 14:00	0.4	0.41	0.0002 U	0.0002 U	0.02 U	0.02 U	0.02 U	0.038	0.01 U	0.01 U
GW-12C	5/26/2004 14:00	1.3	1.1	0.0002 U	0.0002 U	0.01 U	0.01 U	0.01 U	0.01 U	0.014 J6J3	0.005 U
GW-12C	9/10/2004 11:00	1.6 J6		0.0002 U		0.022 J6		0.01 U		0.005 U	
GW-12C	5/12/2005 16:30	1.5	1.4	0.0002 U	0.0002 U	0.02 U	0.02 U	0.02 U	0.02 U	0.01 U	0.01 U

mg/L = Milligrams per liter

J = Estimated value

U = UNDETECTED

APPENDIX C
COMPARISON OF MAXIMUM DETECTED GROUNDWATER CONCENTRATIONS
WITH LNAPL WELL MICRO-PURGE RESULTS
Quality Analytical Services Site
Blue Summit, Missouri

Chemical in Groundwater	Units	Maximum Detected Concentrations	
		Monitoring Wells ¹	LNAPL Wells ²
Arsenic	mg/L	0.088	0.18
Benzene	mg/L	0.0016	0.21
Cadmium	mg/L	0.048	0.0012
Chlbroethane	mg/L	0.0017	0.043
1,4-Dichlorobenzene	mg/L	ND	0.019
cis-1,2-DCE	mg/L	0.19	0.0072
1,4-Dioxane	mg/L	2.8	0.27
Lead	mg/L	0.56	0.014
Manganese	mg/L	25	11
MTBE	mg/L	0.015	0.024
Naphthalene	mg/L	0.0059	0.13
Tetrachloroethylene	mg/L	ND	0.0031
Trichloroethylene	mg/L	0.019	0.0015
1,2,4-Trimethylbenzene	mg/L	0.0082	0.13
1,3,5- Trimethylbenzene	mg/L	0.0043	0.038
Vinyl Chloride	mg/L	0.14	0.001 U
Xylenes, total	mg/L	0.0069	0.63

Notes:

1. Obtained from Table 4-4b.
2. Product Wells (EPA-R-1, GW-2R, GW-3, and GW-4) maximum detected from Sep 04, Nov 05 and Nov 06 micro-purge results.

APPENDIX C
SUMMARY OF VOC RESULTS IN LNAPL WELLS
VOCs Sep04-Nov06

Constituent	CAS No.	EPA-R-1 9/9/2004 (ug/L)	GW-2R 9/9/2004 (ug/L)	GW-3 9/9/2004 (ug/L)	GW-4 9/9/2004 (ug/L)	EPA-R-1 Nov-05 (ug/L)	GW-2R Nov-05 (ug/L)	GW-4 Nov-05 (ug/L)	EPA-R-1 11/22/2006 (ug/L)	GW-3 11/22/2006 (ug/L)	GW-4 11/22/2006 (ug/L)	GW-2R 11/22/2006 ug/l
Acetone	67-64-1	< 50	< 50	< 50	< 50 UJ	< 50	< 50	< 50	< 50UJ	270	< 50UJ	< 50UJ
Acrolein (Propenal)	107-02-8	< 50	< 50	< 50	< 50 UJ	< 50	< 50	< 50	< 50UJ	< 50UJ	< 50UJ	< 50UJ
Acrylonitrile	107-13-1	< 50	< 50	< 50	< 50 UJ	< 50	< 50	< 50	< 50	< 50	< 50	< 50
Allyl chloride	107-05-1	< 50	< 50	< 50	< 50 UJ	< 50	< 50	< 50	< 50UJ	< 50UJ	< 50UJ	< 50UJ
Benzene	71-43-2	210	6.1	140	27 J	17	1.0	39	42	110	5	< 1.0
Bromobenzene	108-86-1	< 1.0	< 1.0	< 1.0	< 1.0 UJ	< 1.0	< 1.0	< 1.0	< 1.0	< 1.0	< 1.0	< 1.0
Bromochloromethane	74-97-5	< 1.0	< 1.0	< 1.0	< 1.0 UJ	< 1.0	< 1.0	< 1.0	< 1.0	< 1.0	< 1.0	< 1.0
Bromodichloromethane	75-27-4	< 1.0	< 1.0	< 1.0	< 1.0 UJ	< 1.0	< 1.0	< 1.0	< 1.0	< 1.0	< 1.0	< 1.0
Bromoform	75-25-2	< 1.0	< 1.0	< 1.0	< 1.0 UJ	< 1.0	< 1.0	< 1.0	< 1.0UR	< 1.0	< 1.0	< 1.0
Bromomethane	74-83-9	< 1.0	< 1.0	< 1.0	< 1.0 UJ	< 1.0	< 1.0	< 1.0	< 1.0	< 1.0UJ	< 1.0	< 1.0
2-Butanone (MEK)	78-93-3	< 50	< 50	< 50	< 50 UJ	< 50	< 50	< 50	< 50UR	< 50UJ	< 50	< 50
n-butylbenzene	104-51-8	1.8	2.2	< 1.0	< 1.0 UJ	< 1.0	< 1.0	< 1.0	16	< 1.0	< 1.0	< 1.0
sec-butylbenzene	135-98-8	1.5	2.2	< 1.0	< 1.0 UJ	< 1.0	< 1.0	< 1.0	2.8	1.2	< 1.0	< 1.0
tert-butylbenzene	98-06-6	< 1.0	< 1.0	< 1.0	< 1.0 UJ	< 1.0	< 1.0	< 1.0	< 1.0	< 1.0	< 1.0	< 1.0
Carbon disulfide	75-15-0	< 1.0	< 1.0	< 1.0	< 1.0 UJ	< 1.0	< 1.0	< 1.0	< 1.0	< 1.0	< 1.0	< 1.0
Carbon tetrachloride	56-23-5	1.4	< 1.0	< 1.0	< 1.0 UJ	< 1.0	< 1.0	< 1.0	< 1.0	< 1.0	< 1.0	< 1.0
Chlorobenzene	108-90-7	4.5	3.2	1.5	1.5 J	1.3	1.0	1.4	5.7	2.6	< 1.0	< 1.0
Chlorodibromomethane	124-48-1	< 1.0	< 1.0	< 1.0	< 1.0 UJ	< 1.0	< 1.0	< 1.0	< 1.0	< 1.0	< 1.0	< 1.0
Chloroethane	75-00-3	< 1.0 UJ	< 1.0 UJ	34 J	< 1.0 UJ	< 1.0	< 1.0	4.9	< 1.0	16	< 1.0	< 1.0
2-Chloroethyl vinyl ether	110-75-8	< 10	< 10	< 10	< 10 UJ	< 10	< 10	< 10	< 10UR	< 10UJ	< 10	< 10
Chloroform	67-66-3	< 5.0	< 5.0	< 5.0	< 5.0 UJ	< 5.0	< 5.0	< 5.0	< 5.0	< 5.0	< 5.0	< 5.0
Chloromethane	74-87-3	< 1.0	< 1.0	< 1.0	< 1.0 UJ	< 1.0	< 1.0	< 1.0	< 1.0	< 1.0	< 1.0	< 1.0
2-Chlorotoluene	95-49-8	< 1.0	< 1.0	< 1.0	< 1.0 UJ	< 1.0	< 1.0	< 1.0	< 1.0	< 1.0	< 1.0	< 1.0
4 Chlorotoluene	106-43-4	< 1.0	< 1.0	< 1.0	< 1.0 UJ	< 1.0	< 1.0	< 1.0	< 1.0	< 1.0	< 1.0	< 1.0
1,2-Dibromo-3-chloropropane	96-12-8	< 1.0 UJ	< 1.0 UJ	< 1.0 UJ	< 1.0 UJ	< 1.0	< 1.0	< 1.0	< 1.0	< 1.0	< 1.0	< 1.0
1,2-Dibromoethane	106-93-4	< 1.0	< 1.0	< 1.0	< 1.0 UJ	< 1.0	< 1.0	< 1.0	< 1.0	< 1.0	< 1.0	< 1.0
Dibromomethane	74-95-3	< 1.0	< 1.0	< 1.0	< 1.0 UJ	< 1.0	< 1.0	< 1.0	< 1.0	< 1.0	< 1.0	< 1.0
1,2-Dichlorobenzene	95-50-1	< 1.0	< 1.0	< 1.0	2.8 J	1.1	1.0	2.6	5.6	5.3	1.5	< 1.0
1,3-Dichlorobenzene	541-73-1	< 1.0	1.1	2.3	< 1.0 UJ	< 1.0	< 1.0	< 1.0	< 1.0	3	< 1.0	< 1.0
1,4-Dichlorobenzene	106-46-7	< 1.0	6.3	13	< 1.0 UJ	< 1.0	4.0	2.7	1.1	19	< 1.0	< 1.0
trans-1,4-Dichloro-2-butene	110-57-6	< 1.0	< 1.0	< 1.0	< 1.0 UJ	< 1.0	< 1.0	< 1.0	< 1.0	< 1.0	< 1.0	< 1.0
Dichlorodifluoromethane	75-71-8	< 1.0	< 1.0	< 1.0	< 1.0 UJ	< 1.0	< 1.0	< 1.0	< 1.0	< 1.0	< 1.0	< 1.0
1,1-Dichloroethane	75-34-3	7.3	< 1.0	3.8	1.5 J	1.8	1.0	1.5	10	1.2	< 1.0	< 1.0
1,2-Dichloroethane	107-06-2	< 1.0	< 1.0	< 1.0	< 1.0 UJ	< 1.0	< 1.0	< 1.0	< 1.0	< 1.0	< 1.0	< 1.0
1,1-Dichloroethene		< 1.0	< 1.0	< 1.0	< 1.0 UJ	< 1.0	< 1.0	< 1.0	< 1.0	< 1.0	< 1.0	< 1.0
cis-1,2-Dichloroethene	156-59-2	2.4	< 1.0	< 1.0	< 1.0 UJ	< 1.0	< 1.0	< 1.0	7.2	< 1.0	< 1.0	< 1.0
trans-1,2-Dichloroethene	156-60-5	< 1.0	< 1.0	< 1.0	< 1.0 UJ	< 1.0	< 1.0	< 1.0	< 1.0	< 1.0	< 1.0	< 1.0
1,2-Dichloropropane	78-87-5	< 1.0	< 1.0	< 1.0	< 1.0 UJ	< 1.0	< 1.0	< 1.0	< 1.0	< 1.0	< 1.0	< 1.0
1,3-Dichloropropane	142-28-9	< 1.0	< 1.0	< 1.0	< 1.0 UJ	< 1.0	< 1.0	< 1.0	< 1.0	< 1.0	< 1.0	< 1.0
2,2-Dichloropropane	594-20-7	< 1.0	< 1.0	< 1.0	< 1.0 UJ	< 1.0	< 1.0	< 1.0	< 1.0	< 1.0	< 1.0	< 1.0
1,1-Dichloropropene	563-58-6	< 1.0	< 1.0	< 1.0	< 1.0 UJ	< 1.0	< 1.0	< 1.0	< 1.0	< 1.0	< 1.0	< 1.0
cis-1,3-Dichloropropene	10061-01-5	< 1.0	< 1.0	< 1.0	< 1.0 UJ	< 1.0	< 1.0	< 1.0	< 1.0	< 1.0	< 1.0	< 1.0
trans-1,3-Dichloropropene	10061-02-6	< 1.0	< 1.0	< 1.0	< 1.0 UJ	< 1.0	< 1.0	< 1.0	< 1.0	< 1.0	< 1.0	< 1.0
Di-isopropyl ether	108-20-3	< 1.0	< 1.0	< 1.0	< 1.0 UJ	< 1.0	< 1.0	< 1.0	< 1.0	< 1.0	< 1.0	< 1.0
1,4-Dioxane	123-91-1	< 100	< 100	270	< 100 UJ	< 100	< 100	< 100	< 100UJ	140J	< 100UJ	< 100UJ
Ethylbenzene	100-41-4	28	< 1.0	< 1.0	22 J	7.1	1.0	13	47	< 1.0	5.2	< 1.0

APPENDIX C
SUMMARY OF VOC RESULTS IN LNAPL WELLS
VOCs Sep04-Nov06

Constituent	CAS No.	EPA-R-1 9/9/2004 (ug/L)	GW-2R 9/9/2004 (ug/L)	GW-3 9/9/2004 (ug/L)	GW-4 9/9/2004 (ug/L)	EPA-R-1 Nov-05 (ug/L)	GW-2R Nov-05 (ug/L)	GW-4 Nov-05 (ug/L)	EPA-R-1 11/22/2006 (ug/L)	GW-3 11/22/2006 (ug/L)	GW-4 11/22/2006 (ug/L)	GW-2R 11/22/2006 ug/l
Ethyl methacrylate	97-63-2	< 5.0	< 5.0	< 5.0	< 5.0 UJ	< 5.0	< 5.0	< 5.0	< 5.0 UJ	< 5.0 UJ	< 5.0 UJ	< 5.0 UJ
Hexachlorobutadiene	87-68-3	< 1.0	< 1.0	< 1.0	< 1.0 UJ	< 1.0	< 1.0	< 1.0	< 1.0	< 1.0	< 1.0	< 1.0
2-Hexanone	591-78-6	< 50	< 50	< 50	< 50 UJ	< 50	< 50	< 50	< 50	< 50	< 50	< 50
Iodomethane	74-88-4	< 50	< 50	< 50	< 50 UJ	< 50	< 50	< 50	< 50	< 50	< 50	< 50
Isopropylbenzene	98-82-8	3.4	3.4	2	< 1.0 UJ	1.0	1.0	2.6	5.6	2.9	< 1.0	< 1.0
p-isopropyltoluene	99-87-6	2	< 1.0	< 1.0	< 1.0 UJ	1.0	1.0	1.0	4	1.2	< 1.0	< 1.0
Methacrylonitrile	126-98-7	< 50	< 50	< 50	< 50 UJ	< 50	< 50	< 50	< 50	< 50	< 50	< 50
Methylene chloride	75-09-2	< 5.0	< 5.0	< 5.0	< 5.0 UJ	< 5	< 5	< 5	< 5.0	< 5.0	< 5.0	< 5.0
Methyl methacrylate	80-62-6	< 50	< 50	< 50	< 50 UJ	< 50	< 50	< 50	< 50 UJ	< 50 UJ	< 50 UJ	< 50 UJ
4-Methyl-2-pentanone (MIBK)	108-10-1	< 50	< 50	< 50	< 50 UJ	< 50	< 50	< 50	< 50	< 50	< 50	< 50
Methyl tert-butyl ether (MTBE)	1634-04-4	24 J	1.9 J	11 J	< 1.0 UJ	1.5	2.6	3.1	5.9	5	1.3	< 1.0
Naphthalene	91-20-3	110 J	< 5.0	< 5.0	< 5.0 UJ	11	5.0	31	130	< 5.0	< 5.0	< 5.0
Pentachloroethane	76-01-7	< 50	< 50	< 50	< 50 UJ	< 50	< 50	< 50	< 50 UJ	< 50 UJ	< 50 UJ	< 50 UJ
Propionitrile (ethyl cyanide)	107-12-0	< 50	< 50	< 50	< 50 UJ	< 50	< 50	< 50	< 50	< 50	< 50	< 50
n-Propylbenzene	99-87-6	6.9	3.5	2.7	< 1.0 UJ	1.6	1.0	2.5	9.4	3.4	< 1.0	< 1.0
Styrene	100-42-5	< 1.0	< 1.0	< 1.0	< 1.0 UJ	1.0	1.0	1.0	< 1.0	< 1.0	< 1.0	< 1.0
1,1,2,2-Tetrachloroethane	79-34-5	< 1.0	< 1.0	< 1.0	< 1.0 UJ	1.0	1.0	1.0	< 1.0	< 1.0	< 1.0	< 1.0
1,1,1,2-Tetrachloroethane	630-20-6	< 1.0	< 1.0	< 1.0	< 1.0 UJ	1.0	1.0	1.0	< 1.0	< 1.0	< 1.0	< 1.0
Tetrachloroethene	127-18-4	2	< 1.0	< 1.0	< 1.0 UJ	2.2	< 1.0	< 1.0	3.1	< 1.0	< 1.0	< 1.0
Toluene	108-88-3	170 J	< 5.0	< 5.0	< 5.0 UJ	22	5.0	8.2	140	< 5.0	< 5.0	< 5.0
1,2,3-Trichlorobenzene	87-61-6	< 1.0	< 1.0	< 1.0	< 1.0 UJ	1.0	1.0	1.0	< 1.0	< 1.0	< 1.0	< 1.0
1,2,4-Trichlorobenzene	120-82-1	< 1.0	< 1.0	1.4 J	< 1.0 UJ	1.0	1.0	1.0	< 1.0	< 1.0	< 1.0	< 1.0
1,1,1-Trichloroethane	71-55-6	12	< 1.0	< 1.0	< 1.0 UJ	3.2	1.0	1.0	16	< 1.0	< 1.0	< 1.0
1,1,2-Trichloroethane	79-00-5	< 1.0 UJ	< 1.0 UJ	< 1.0 UJ	< 1.0 UJ	1.0	1.0	1.0	< 1.0	< 1.0	< 1.0	< 1.0
Trichloroethene	79-01-6	1.5	< 1.0	< 1.0	< 1.0 UJ	1.0	1.0	1.0	1.3	< 1.0	< 1.0	< 1.0
1,2,4-Trimethylbenzene	95-63-6	78 J	< 1.0	8 J	< 1.0 UJ	16	1.0	12	130	8.9	4.2 J	< 1.0
1,3,5-Trimethylbenzene	108-67-8	16	< 1.0	< 1.0	< 1.0 UJ	5.4	1.0	1.4	38	< 1.0	1.8	< 1.0
Vinyl chloride	75-01-4	< 1.0	< 1.0	< 1.0	< 1.0 UJ	1.0	1.0	1.0	< 1.0	< 1.0	< 1.0	< 1.0
Total xylenes	1330-20-7	530 J	< 3.0	22 J	220 J	76	3.0	440	630	40	210 J	< 3.0
Trichlorofluoromethane	75-69-4	4.6	< 1.0	< 1.0	< 1.0 UJ	1.9	1.0	1.0				
1,2,3-Trimethylbenzene		< 1.0	< 1.0	< 1.0	< 1.0 UJ	< 1.0	1.0	< 1.0				

APPENDIX C
SUMMARY OF METALS DATA FROM LNAPL WELLS - FALL 2005

Parameter	Sample Date	Sample ID	Result mg/l
ARSENIC	Nov-05	EPA-R-1	0.18
ARSENIC	Nov-05	GW-2R	0.022
ARSENIC	Nov-05	GW-4	0.098
BARIUM	Nov-05	EPA-R-1	0.44
BARIUM	Nov-05	GW-2R	0.5
BARIUM	Nov-05	GW-4	0.36
CADMIUM	Nov-05	EPA-R-1 <	0.005 U
CADMIUM	Nov-05	GW-2R <	0.005 U
CADMIUM	Nov-05	GW-4 <	0.005 U
CHROMIUM	Nov-05	EPA-R-1	0.042
CHROMIUM	Nov-05	GW-2R	0.058
CHROMIUM	Nov-05	GW-4	0.088
LEAD	Nov-05	EPA-R-1	0.014
LEAD	Dec-05	GW-2R <	0.005 U
LEAD	Dec-05	GW-4 <	0.005 U
MANGANESE	Dec-05	EPA-R-1	11
MANGANESE	Dec-05	GW-2R	5.1
MANGANESE	Dec-05	GW-4	7.4
MERCURY	Dec-05	EPA-R-1 <	0.0002 U
MERCURY	Dec-05	GW-2R <	0.0002 U
MERCURY	Dec-05	GW-4 <	0.0002 U
NICKEL	Dec-05	EPA-R-1 <	0.02 U
NICKEL	Dec-05	GW-2R	0.1
NICKEL	Dec-05	GW-4 <	0.02 U
SELENIUM	Dec-05	EPA-R-1 <	0.02 U
SELENIUM	Dec-05	GW-2R <	0.02 U
SELENIUM	Dec-05	GW-4 <	0.02 U
SILVER	Dec-05	EPA-R-1 <	0.01 U
SILVER	Dec-05	GW-2R <	0.01 U
SILVER	Dec-05	GW-4 <	0.01 U

APPENDIX C
SUMMARY OF METALS FROM LNAPL WELL - NOV 2006

Analyte	CAS No.	LNAPL-GW
		Nov-06 (ug/L)
Arsenic, Total	7440-38-2	25
Barium, Total	7440-39-3	<10
Cadmium, Total	7440-43-9	1.2
Chromium, Total	7440-47-3	11
Lead, Total	7439-92-1	<10
Manganese, Total	7439-96-5	<10
Nickel, Total	7440-02-0	<10
Selenium, Total	7782-49-2	<10
Silver, Total	7440-22-4	<10

APPENDIX
D

APPENDIX D

Surface Water and Sediment Data Laboratory Reports



71 Zaca Lane
San Luis Obispo CA 93401

vox 805.544.4696
fax 805.544.8226

CLIENT ☐ EDO ☐ LIFT ☐ EDF ☐ DW ☐ EDT ☐

CHAIN of CUSTODY

1 of 2

report to <u>Mick Cossart</u>	vox <u>805-544-3300</u>	fax <u>805-544-6193</u>	ANALYSIS REQUESTED										Turnaround Time				
company <u>Deffenbaugh Industries</u>	pro] <u>ISC-KC (QA-KC)</u>		<u>14-Dioxane</u> <u>(1625M)</u>										ASAP <input type="checkbox"/> 48 hr <input type="checkbox"/>				
address <u>18181 W. 53rd</u> <u>Shawnee, KS 66203</u>	pro] #												12 hr <input type="checkbox"/> 72 hr <input type="checkbox"/>				
sampler <u>Chris Eaton</u>		24 hr <input type="checkbox"/> std <input checked="" type="checkbox"/>															
ZymaX use only	SAMPLE DESCRIPTION	Date Sampled	Time	Matrix	Preserve											# of containers	Remarks
37186-1	GW-1	9/8/04	0928	water		X	X										
-2	GW-5	9/8/04	0955														
-3	GW-6A	9/8/04	1450														
-4	GW-7	9/8/04	1245														
-5	GW-8A	9/9/04	1100														
-6	GW-8B	9/9/04	1120														
-7	GW-9A	9/9/04	1000														
-8	GW-9B	9/9/04	0940														
-9	GW-10A	9/9/04	0900														
-10	GW-10B	9/9/04	0850														
-11	GW-11A	9/8/04	1330														
-12	GW-11B	9/8/04	1415														

Comments

Relinquished by:

Signature Chris Eaton
Print CHRIS EATON
Company Deffenbaugh
Date 9/10/04 Time 1400

Received by:

Signature _____
Print _____
Company _____
Date _____ Time _____

Sample integrity upon receipt:

Samples received intact ☐
Samples received cold ☐
Custody seals ☐
Correct container types ☐

Bill 3rd party:

PO#: _____
Quote yes no

Relinquished by:

Signature _____
Print _____
Company _____
Date _____ Time _____

Received by ZymaX envirotechology, inc:

Signature Billy J. Atkins
Print ZYMAX
Company ZYMAX
Date 9/10/04 Time 1200



Page ____ of ____



REPORT OF ANALYTICAL RESULTS

Client: Mick Cossairt
Deffenbaugh Industries, Inc
P.O. Box 3220
Shawnee, KS 66217

Lab Number: 37162-1
Collected: 09/08/04
Received: 09/10/04
Matrix: Aqueous

Project: ISC-Oxbow
Project Number:
Collected by: Vaughn/Meavis

Sample Description:
OX1/GW
Analyzed: 09/16/04
Method: EPA 1625M

CONSTITUENT	PQL* ug/L	RESULT** ug/L
1,4-Dioxane	1.0	ND
Percent Surrogate Recovery		85

ZymaX envirotechnology, inc. is certified by CA Department of Health Services: Laboratory #1717

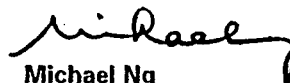
*PQL - Practical Quantitation Limit

**Results listed as ND would have been reported if present at or above the listed PQL.

Note: Extracted by EPA 3510 on 09/15/04.

SA3922
MSD #6
37162-1d.xls
MN/jdm/yl/sk/sd/kr

Submitted by,
ZymaX envirotechnology, inc.


Michael Ng
Assistant Lab Director



REPORT OF ANALYTICAL RESULTS

Client: Mick Cossairt
Deffenbaugh Industries, Inc
P.O. Box 3220
Shawnee, KS 66217

Lab Number: 37162-2
Collected: 09/08/04
Received: 09/10/04
Matrix: Soil

Project: ISC-Oxbow
Project Number:
Collected by: Vaughn/Meavis

Sample Description:
OX1/SS
Analyzed: 09/22/04
Method: EPA 1625M

CONSTITUENT	PQL* mg/kg	RESULT** mg/kg
1,4-Dioxane	0.01	ND
Percent Surrogate Recovery		62

ZymaX envirotechnology, inc. is certified by CA Department of Health Services: Laboratory #1717

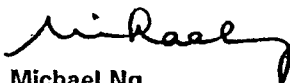
*PQL - Practical Quantitation Limit

**Results listed as ND would have been reported if present at or above the listed PQL.

Note: Extracted by EPA 3550 on 09/22/04.

SS5388
MSD #6
37162-2d.xls
MN/jdm/yl/cj/kg

Submitted by,
ZymaX envirotechnology, inc.


Michael Ng
Assistant Lab Director



REPORT OF ANALYTICAL RESULTS

Client: Mick Cossairt
Deffenbaugh Industries, Inc
P.O. Box 3220
Shawnee, KS 66217

Lab Number: 37162-3
Collected: 09/08/04
Received: 09/10/04
Matrix: Aqueous

Project: ISC-Oxbow
Project Number:
Collected by: Vaughn/Meavis

Sample Description:
OX2/GW
Analyzed: 09/16/04
Method: EPA 1625M

CONSTITUENT	PQL* ug/L	RESULT** ug/L
1,4-Dioxane	1.0	ND
Percent Surrogate Recovery		122

ZymaX envirotechnology, inc. is certified by CA Department of Health Services: Laboratory #1717

*PQL - Practical Quantitation Limit

**Results listed as ND would have been reported if present at or above the listed PQL.

Note: Extracted by EPA 3510 on 09/15/04.

SA3922
MSD #6
37162-3d.xls
MN/jdm/yl/sk/sd/kr

Submitted by,
ZymaX envirotechnology, inc.

Michael Ng
Assistant Lab Director



REPORT OF ANALYTICAL RESULTS

Client: Mick Cossairt
Deffenbaugh Industries, Inc
P.O. Box 3220
Shawnee, KS 66217

Lab Number: 37162-4
Collected: 09/08/04
Received: 09/10/04
Matrix: Soil

Project: ISC-Oxbow
Project Number:
Collected by: Vaughn/Meavis

Sample Description:
OX2/SS
Analyzed: 09/22/04
Method: EPA 1625M

CONSTITUENT	PQL* mg/kg	RESULT** mg/kg
1,4-Dioxane	0.01	ND
Percent Surrogate Recovery		93

ZymaX envirotechnology, inc. is certified by CA Department of Health Services: Laboratory #1717

*PQL - Practical Quantitation Limit

**Results listed as ND would have been reported if present at or above the listed PQL.

Note: Extracted by EPA 3550 on 09/22/04.

SS5388
MSD #6
37162-4d.xls
MN/jdm/yl/cj/sk/kg

Submitted by,
ZymaX envirotechnology, inc.

Michael Ng
Assistant Lab Director



REPORT OF ANALYTICAL RESULTS

Client: Mick Cossairt
Deffenbaugh Industries, Inc
P.O. Box 3220
Shawnee, KS 66217

Lab Number: 37162-5
Collected: 09/08/04
Received: 09/10/04
Matrix: Aqueous

Project: ISC-Oxbow
Project Number:
Collected by: Vaughn/Meavis

Sample Description:
OX3/GW
Analyzed: 09/16/04
Method: EPA 1625M

CONSTITUENT	PQL* ug/L	RESULT** ug/L
1,4-Dioxane	1.0	ND
Percent Surrogate Recovery		97

ZymaX envirotechnology, inc. is certified by CA Department of Health Services: Laboratory #1717

*PQL - Practical Quantitation Limit

**Results listed as ND would have been reported if present at or above the listed PQL.

Note: Extracted by EPA 3510 on 09/15/04.

SA3922
MSD #6
37162-5d.xls
MN/jdm/yl/sk/sd/kr

Submitted by,
ZymaX envirotechnology, inc.

Michael Ng
Assistant Lab Director



REPORT OF ANALYTICAL RESULTS

Client: Mick Cossairt
Deffenbaugh Industries, Inc
P.O. Box 3220
Shawnee, KS 66217

Lab Number: 37162-6
Collected: 09/08/04
Received: 09/10/04
Matrix: Soil

Project: ISC-Oxbow
Project Number:
Collected by: Vaughn/Meavis

Sample Description:
OX3/SS
Analyzed: 09/23/04
Method: EPA 1625M

CONSTITUENT	PQL* mg/kg	RESULT** mg/kg
1,4-Dioxane	0.01	ND
Percent Surrogate Recovery		65

ZymaX envirotechnology, inc. is certified by CA Department of Health Services: Laboratory #1717

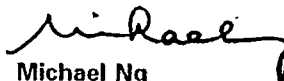
*PQL - Practical Quantitation Limit

**Results listed as ND would have been reported if present at or above the listed PQL.

Note: Extracted by EPA 3550 on 09/23/04.

SS5388
MSD #6
37162-6d.xls
MN/jdm/sk/tl/kg

Submitted by,
ZymaX envirotechnology, inc.


Michael Ng
Assistant Lab Director



REPORT OF ANALYTICAL RESULTS

Client: Mick Cossairt
Deffenbaugh Industries, Inc
P.O. Box 3220
Shawnee, KS 66217

Lab Number: 37162-7
Collected: 09/08/04
Received: 09/10/04
Matrix: Aqueous

Project: ISC-Oxbow
Project Number:
Collected by: Vaughn/Meavis

Sample Description:
OX4/GW
Analyzed: 09/16/04
Method: EPA 1625M

CONSTITUENT	PQL* ug/L	RESULT** ug/L
1,4-Dioxane	1.0	ND
Percent Surrogate Recovery		101

ZymaX envirotechnology, inc. is certified by CA Department of Health Services: Laboratory #1717

*PQL - Practical Quantitation Limit

**Results listed as ND would have been reported if present at or above the listed PQL.

Note: Extracted by EPA 3510 on 09/15/04.

SA3922
MSD #6
37162-7d.xls
MN/jdm/yl/sk/sd/kr

Submitted by,
ZymaX envirotechnology, inc.


Michael Ng
Assistant Lab Director



REPORT OF ANALYTICAL RESULTS

Client: Mick Cossairt
Deffenbaugh Industries, Inc
P.O. Box 3220
Shawnee, KS 66217

Lab Number: 37162-8
Collected: 09/08/04
Received: 09/10/04
Matrix: Soil

Project: ISC-Oxbow
Project Number:
Collected by: Vaughn/Meavis

Sample Description:
OX4/SS
Analyzed: 09/23/04
Method: EPA 1625M

CONSTITUENT	PQL * mg/kg	RESULT ** mg/kg
1,4-Dioxane	0.01	ND
Percent Surrogate Recovery		70

ZymaX envirotechnology, inc. is certified by CA Department of Health Services: Laboratory #1717

*PQL - Practical Quantitation Limit

**Results listed as ND would have been reported if present at or above the listed PQL.

Note: Extracted by EPA 3550 on 09/23/04.

SS5388
MSD #6
37162-8d.xls
MN/jdm/sk/tl/kg

Submitted by,
ZymaX envirotechnology, inc.

Michael Ng
Assistant Lab Director



REPORT OF ANALYTICAL RESULTS

Client: Mick Cossairt
Deffenbaugh Industries, Inc
P.O. Box 3220
Shawnee, KS 66217

Lab Number: 37162-9
Collected: 09/08/04
Received: 09/10/04
Matrix: Aqueous

Project: ISC-Oxbow
Project Number:
Collected by: Vaughn/Meavis

Sample Description:
OX5/GW
Analyzed: 09/16/04
Method: EPA 1625M

CONSTITUENT	PQL * ug/L	RESULT ** ug/L
1,4-Dioxane	1.0	ND
Percent Surrogate Recovery		91

ZymaX envirotechnology, inc. is certified by CA Department of Health Services: Laboratory #1717

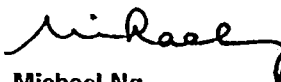
*PQL - Practical Quantitation Limit

**Results listed as ND would have been reported if present at or above the listed PQL.

Note: Extracted by EPA 3510 on 09/15/04.

SA3922
MSD #6
37162-9d.xls
MN/jdm/yl/sk/sd/kr

Submitted by,
ZymaX envirotechnology, inc.


Michael Ng
Assistant Lab Director



REPORT OF ANALYTICAL RESULTS

Client: Mick Cossairt
Deffenbaugh Industries, Inc
P.O. Box 3220
Shawnee, KS 66217

Lab Number: 37162-10
Collected: 09/08/04
Received: 09/10/04
Matrix: Soil

Project: ISC-Oxbow
Project Number:
Collected by: Vaughn/Meavis

Sample Description:
OX5/SS
Analyzed: 09/23/04
Method: EPA 1625M

CONSTITUENT	PQL * mg/kg	RESULT ** mg/kg
1,4-Dioxane	0.01	ND
Percent Surrogate Recovery		74

ZymaX envirotechnology, inc. is certified by CA Department of Health Services: Laboratory #1717

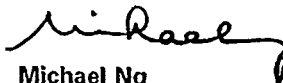
*PQL - Practical Quantitation Limit

**Results listed as ND would have been reported if present at or above the listed PQL.

Note: Extracted by EPA 3550 on 09/22/04.

SS5388
MSD #6
3716210d.xls
MN/jdm/yl/cj/sk/kg

Submitted by,
ZymaX envirotechnology, inc.


Michael Ng
Assistant Lab Director



REPORT OF ANALYTICAL RESULTS

Client: Mick Cossairt
Deffenbaugh Industries, Inc
P.O. Box 3220
Shawnee, KS 66217

Lab Number: 37162-11
Collected: 09/08/04
Received: 09/10/04
Matrix: Aqueous

Project: ISC-Oxbow
Project Number:
Collected by: Vaughn/Meavis

Sample Description:
OX6/GW
Analyzed: 09/16/04
Method: EPA 1625M

CONSTITUENT	PQL* ug/L	RESULT** ug/L
1,4-Dioxane	1.0	ND
Percent Surrogate Recovery		107

ZymaX envirotechnology, inc. is certified by CA Department of Health Services: Laboratory #1717

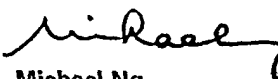
*PQL - Practical Quantitation Limit

**Results listed as ND would have been reported if present at or above the listed PQL.

Note: Extracted by EPA 3510 on 09/15/04.

SA3922
MSD #6
3716211d.xls
MN/jdm/yl/sd/kr

Submitted by,
ZymaX envirotechnology, inc.


Michael Ng
Assistant Lab Director



REPORT OF ANALYTICAL RESULTS

Client: Mick Cossairt
Deffenbaugh Industries, Inc
P.O. Box 3220
Shawnee, KS 66217

Lab Number: 37162-12
Collected: 09/08/04
Received: 09/10/04
Matrix: Soil

Project: ISC-Oxbow
Project Number:
Collected by: Vaughn/Meavis

Sample Description:
OX6/SS
Analyzed: 09/23/04
Method: EPA 1625M

CONSTITUENT	PQL* mg/kg	RESULT** mg/kg
1,4-Dioxane	0.01	ND
Percent Surrogate Recovery		51

ZymaX envirotechnology, inc. is certified by CA Department of Health Services: Laboratory #1717

*PQL - Practical Quantitation Limit

**Results listed as ND would have been reported if present at or above the listed PQL.

Note: Extracted by EPA 3550 on 09/22/04.

SS5388
MSD #6
3716212d.xls
MN/jdm/sk/tl/kg

Submitted by,
ZymaX envirotechnology, inc.

Michael Ng
Assistant Lab Director



REPORT OF ANALYTICAL RESULTS

Client: Mick Cossart
Deffenbaugh Industries, Inc
P.O. Box 3220
Shawnee, KS 66217

Lab Number: 37162-13
Collected: 09/08/04
Received: 09/10/04
Matrix: Aqueous

Project: ISC-Oxbow
Project Number:
Collected by: Vaughn/Meavis

Sample Description:
OX7/GW
Analyzed: 09/16/04
Method: EPA 1625M

CONSTITUENT	PQL* ug/L	RESULT** ug/L
1,4-Dioxane	1.0	ND
Percent Surrogate Recovery		126

ZymaX envirotechnology, inc. is certified by CA Department of Health Services: Laboratory #1717

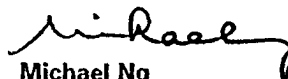
*PQL - Practical Quantitation Limit

**Results listed as ND would have been reported if present at or above the listed PQL.

Note: Extracted by EPA 3510 on 09/15/04.

SA3922
MSD #6
3716213d.xls
MN/jdm/yl/sk/sd/kr

Submitted by,
ZymaX envirotechnology, inc.


Michael Ng
Assistant Lab Director



REPORT OF ANALYTICAL RESULTS

Client: Mick Cossairt
Deffenbaugh Industries, Inc
P.O. Box 3220
Shawnee, KS 66217

Lab Number: 37162-14
Collected: 09/08/04
Received: 09/10/04
Matrix: Soil

Project: ISC-Oxbow
Project Number:
Collected by: Vaughn/Meavis

Sample Description:
OX7/SS
Analyzed: 09/22/04
Method: EPA 1625M

CONSTITUENT	PQL* mg/kg	RESULT** mg/kg
1,4-Dioxane	0.01	ND
Percent Surrogate Recovery		138

ZymaX envirotechnology, inc. is certified by CA Department of Health Services: Laboratory #1717

*PQL - Practical Quantitation Limit

**Results listed as ND would have been reported if present at or above the listed PQL.

Note: Extracted by EPA 3550 on 09/22/04.

SS5388
MSD #6
3716214d.xls
MN/jdm/yl/cj/sk/kg

Submitted by,
ZymaX envirotechnology, inc.

Michael Ng
Assistant Lab Director



REPORT OF ANALYTICAL RESULTS

Client: Mick Cossairt
Deffenbaugh Industries, Inc
P.O. Box 3220
Shawnee, KS 66217

Lab Number: 37162-15
Collected: 09/08/04
Received: 09/10/04
Matrix: Aqueous

Project: ISC-Oxbow
Project Number:
Collected by: Vaughn/Meavis

Sample Description:
OX8/GW
Analyzed: 09/16/04
Method: EPA 1625M

CONSTITUENT	PQL* ug/L	RESULT** ug/L
1,4-Dioxane	1.0	ND
Percent Surrogate Recovery		98

ZymaX envirotechnology, inc. is certified by CA Department of Health Services: Laboratory #1717

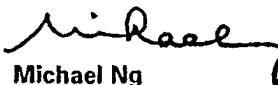
*PQL - Practical Quantitation Limit

**Results listed as ND would have been reported if present at or above the listed PQL.

Note: Extracted by EPA 3510 on 09/15/04.

SA3922
MSD #6
3716215d.xls
MN/jdm/yl/sk/sd/kr

Submitted by,
ZymaX envirotechnology, inc.


Michael Ng
Assistant Lab Director



REPORT OF ANALYTICAL RESULTS

Client: Mick Cossairt
Deffenbaugh Industries, Inc
P.O. Box 3220
Shawnee, KS 66217

Lab Number: 37162-16
Collected: 09/08/04
Received: 09/10/04
Matrix: Soil

Project: ISC-Oxbow
Project Number:
Collected by: Vaughn/Meavis

Sample Description:
OX8/SS
Analyzed: 09/23/04
Method: EPA 1625M

CONSTITUENT	PQL* mg/kg	RESULT** mg/kg
1,4-Dioxane	0.01	ND
Percent Surrogate Recovery		93

ZymaX envirotechnology, inc. is certified by CA Department of Health Services: Laboratory #1717

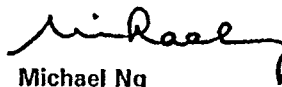
*PQL - Practical Quantitation Limit

**Results listed as ND would have been reported if present at or above the listed PQL.

Note: Extracted by EPA 3550 on 09/23/04.

SS5388
MSD #6
3716216d.xls
MN/jdm/sk/tl/kg

Submitted by,
ZymaX envirotechnology, inc.


Michael Ng
Assistant Lab Director



REPORT OF ANALYTICAL RESULTS

Client: Mick Cossairt
Deffenbaugh Industries, Inc
P.O. Box 3220
Shawnee, KS 66217

Lab Number: 37162-18
Collected: 09/08/04
Received: 09/10/04
Matrix: Soil

Project: ISC-Oxbow
Project Number:
Collected by: Vaughn/Meavis

Sample Description:
OX9/SS
Analyzed: 09/23/04
Method: EPA 1625M

CONSTITUENT	PQL* mg/kg	RESULT** mg/kg
1,4-Dioxane	0.01	ND
Percent Surrogate Recovery		70

ZymaX envirotechnology, inc. is certified by CA Department of Health Services: Laboratory #1717

*PQL - Practical Quantitation Limit

**Results listed as ND would have been reported if present at or above the listed PQL.

Note: Extracted by EPA 3550 on 09/23/04.

SS5388
MSD #6
3716218d.xls
MN/jdm/sk/tl/kg

Submitted by,
ZymaX envirotechnology, inc.

Michael Ng
Assistant Lab Director



REPORT OF ANALYTICAL RESULTS

Client: Mick Cossairt
Deffenbaugh Industries, Inc
P.O. Box 3220
Shawnee, KS 66217

Lab Number: 37162-19
Collected: 09/08/04
Received: 09/10/04
Matrix: Aqueous

Project: ISC-Oxbow
Project Number:
Collected by: Vaughn/Meavis

Sample Description:
OX10/GW
Analyzed: 09/16/04
Method: EPA 1625M

CONSTITUENT	PQL* ug/L	RESULT** ug/L
1,4-Dioxane	1.0	ND
Percent Surrogate Recovery		91

ZymaX envirotechnology, inc. is certified by CA Department of Health Services: Laboratory #1717

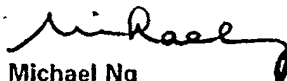
*PQL - Practical Quantitation Limit

**Results listed as ND would have been reported if present at or above the listed PQL.

Note: Extracted by EPA 3510 on 09/15/04.

SA3922
MSD #6
3716219d.xls
MN/jdm/yl/sk/sd/kr

Submitted by,
ZymaX envirotechnology, inc.


Michael Ng
Assistant Lab Director



REPORT OF ANALYTICAL RESULTS

Client: Mick Cossairt
Deffenbaugh Industries, Inc
P.O. Box 3220
Shawnee, KS 66217

Lab Number: 37162-20
Collected: 09/08/04
Received: 09/10/04
Matrix: Soil

Project: ISC-Oxbow
Project Number:
Collected by: Vaughn/Meavis

Sample Description:
OX10/SS
Analyzed: 09/23/04
Method: EPA 1625M

CONSTITUENT	PQL* mg/kg	RESULT** mg/kg
1,4-Dioxane	0.01	ND
Percent Surrogate Recovery		68

ZymaX envirotechnology, inc. is certified by CA Department of Health Services: Laboratory #1717

*PQL - Practical Quantitation Limit

**Results listed as ND would have been reported if present at or above the listed PQL.

Note: Extracted by EPA 3550 on 09/23/04.

SS5388
MSD #6
3716220d.xls
MN/jdm/yl/cj/sk/kg

Submitted by,
ZymaX envirotechnology, inc.

Michael Ng
Assistant Lab Director



REPORT OF ANALYTICAL RESULTS

Client: Mick Cossairt
Deffenbaugh Industries, Inc
P.O. Box 3220
Shawnee, KS 66217

Lab Number: 37162-21
Collected: 09/08/04
Received: 09/10/04
Matrix: Aqueous

Project: ISC-Oxbow
Project Number:
Collected by: Vaughn/Meavis

Sample Description:
BRU1/GW
Analyzed: 09/16/04
Method: EPA 1625M

CONSTITUENT	PQL* ug/L	RESULT** ug/L
1,4-Dioxane	1.0	ND
Percent Surrogate Recovery		95

ZymaX envirotechnology, inc. is certified by CA Department of Health Services: Laboratory #1717

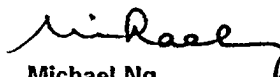
*PQL - Practical Quantitation Limit

**Results listed as ND would have been reported if present at or above the listed PQL.

Note: Extracted by EPA 3510 on 09/15/04.

SA3922
MSD #6
3716221d.xls
MN/jdm/yl/sk/sd/kr

Submitted by,
ZymaX envirotechnology, inc.


Michael Ng
Assistant Lab Director



REPORT OF ANALYTICAL RESULTS

Client: Mick Cossairt
Deffenbaugh Industries, Inc
P.O. Box 3220
Shawnee, KS 66217

Lab Number: 37162-22
Collected: 09/08/04
Received: 09/10/04
Matrix: Aqueous

Project: ISC-Oxbow
Project Number:
Collected by: Vaughn/Meavis

Sample Description:
BRD1/GW
Analyzed: 09/16/04
Method: EPA 1625M

CONSTITUENT	PQL* ug/L	RESULT** ug/L
1,4-Dioxane	1.0	ND
Percent Surrogate Recovery		86

ZymaX envirotechnology, inc. is certified by CA Department of Health Services: Laboratory #1717


*PQL - Practical Quantitation Limit

**Results listed as ND would have been reported if present at or above the listed PQL.

Note: Extracted by EPA 3510 on 09/15/04.

SA3922
MSD #6
3716222d.xls
MN/jdm/yl/sk/sd/kr

Submitted by,
ZymaX envirotechnology, inc.


Michael Ng
Assistant Lab Director



REPORT OF ANALYTICAL RESULTS

Client: Mick Cossairt
Deffenbaugh Industries, Inc
P.O. Box 3220
Shawnee, KS 66217

Lab Number: 37162-23
Collected: 09/08/04
Received: 09/10/04
Matrix: Soil

Project: ISC-Oxbow
Project Number:
Collected by: Vaughn/Meavis

Sample Description: Dup/SS
Analyzed: 09/23/04
Method: EPA 1625M

CONSTITUENT	PQL* mg/kg	RESULT** mg/kg
1,4-Dioxane	0.01	ND
Percent Surrogate Recovery		80

ZymaX envirotechnology, inc. is certified by CA Department of Health Services: Laboratory #1717

*PQL - Practical Quantitation Limit

**Results listed as ND would have been reported if present at or above the listed PQL.

Note: Extracted by EPA 3550 on 09/22/04.

SS5388
MSD #6
3716223d.xls
MN/jdm/yl/cj/sk/kg

Submitted by,
ZymaX envirotechnology, inc.

Michael Ng
Assistant Lab Director



REPORT OF ANALYTICAL RESULTS

Client: Mick Cossairt
Deffenbaugh Industries, Inc
P.O. Box 3220
Shawnee, KS 66217

Lab Number: 37186-1
Collected: 09/08/04
Received: 09/11/04
Matrix: Aqueous

Project: ISC-KC
(QAS-KC)
Project Number:
Collected by: Chris Eaton

Sample Description:
GW-1
Analyzed: 09/16/04
Method: EPA 1625M

CONSTITUENT	PQL * ug/L	RESULT ** ug/L
1,4-Dioxane	1.0	2.2
Percent Surrogate Recovery		92

ZymaX envirotechnology, inc. is certified by CA Department of Health Services: Laboratory #1717

*PQL - Practical Quantitation Limit

**Results listed as ND would have been reported if present at or above the listed PQL.

Note: Extracted by EPA 3510 on 09/15/04.

SA3926
MSD #6
37186-1d.xls
MN/jdm/sd/sk/kr

Submitted by,
ZymaX envirotechnology, inc.

Michael Ng
Assistant Lab Director



REPORT OF ANALYTICAL RESULTS

Client: Mick Cossairt
Deffenbaugh Industries, Inc
P.O. Box 3220
Shawnee, KS 66217

Lab Number: 37186-2
Collected: 09/08/04
Received: 09/11/04
Matrix: Aqueous

Project: ISC-KC
(QAS-KC)
Project Number:
Collected by: Chris Eaton

Sample Description:
GW-5
Analyzed: 09/16/04
Method: EPA 1625M

CONSTITUENT	PQL* ug/L	RESULT** ug/L
1,4-Dioxane	1.0	3.8
Percent Surrogate Recovery		100

ZymaX envirotechnology, inc. is certified by CA Department of Health Services: Laboratory #1717

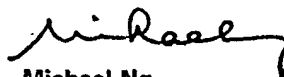
*PQL - Practical Quantitation Limit

**Results listed as ND would have been reported if present at or above the listed PQL.

Note: Extracted by EPA 3510 on 09/15/04.

SA3926
MSD #6
37186-2d.xls
MN/jdm/sd/sk/kr

Submitted by,
ZymaX envirotechnology, inc.


Michael Ng
Assistant Lab Director



REPORT OF ANALYTICAL RESULTS

Client: Mick Cossairt
Deffenbaugh Industries, Inc
P.O. Box 3220
Shawnee, KS 66217

Lab Number: 37186-3
Collected: 09/08/04
Received: 09/11/04
Matrix: Aqueous

Project: ISC-KC
(QAS-KC)
Project Number:
Collected by: Chris Eaton

Sample Description:
GW-6A
Analyzed: 09/16/04
Method: EPA 1625M

CONSTITUENT	PQL* ug/L	RESULT** ug/L
1,4-Dioxane	1.0	2.2
Percent Surrogate Recovery		90

ZymaX envirotechnology, inc. is certified by CA Department of Health Services: Laboratory #1717

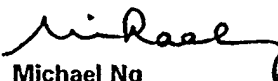
*PQL - Practical Quantitation Limit

**Results listed as ND would have been reported if present at or above the listed PQL.

Note: Extracted by EPA 3510 on 09/15/04.

SA3926
MSD #6
37186-3d.xls
MN/jdm/sd/sk/kr

Submitted by,
ZymaX envirotechnology, inc.


Michael Ng
Assistant Lab Director



REPORT OF ANALYTICAL RESULTS

Client: Mick Cossairt
Deffenbaugh Industries, Inc
P.O. Box 3220
Shawnee, KS 66217

Lab Number: 37186-4
Collected: 09/08/04
Received: 09/11/04
Matrix: Aqueous

Project: ISC-KC
(QAS-KC)
Project Number:
Collected by: Chris Eaton

Sample Description:
GW-7
Analyzed: 09/16/04
Method: EPA 1625M

CONSTITUENT	PQL* ug/L	RESULT** ug/L
1,4-Dioxane	1.0	3.5
Percent Surrogate Recovery		84

ZymaX envirotechnology, inc. is certified by CA Department of Health Services: Laboratory #1717

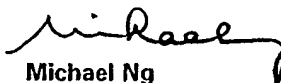
*PQL - Practical Quantitation Limit

**Results listed as ND would have been reported if present at or above the listed PQL.

Note: Extracted by EPA 3510 on 09/15/04.

SA3926
MSD #6
37186-4d.xls
MN/jdm/sd/sk/kr

Submitted by,
ZymaX envirotechnology, inc.


Michael Ng
Assistant Lab Director



REPORT OF ANALYTICAL RESULTS

Client: Mick Cossairt
Deffenbaugh Industries, Inc
P.O. Box 3220
Shawnee, KS 66217

Lab Number: 37186-5
Collected: 09/09/04
Received: 09/11/04
Matrix: Aqueous

Project: ISC-KC
(QAS-KC)
Project Number:
Collected by: Chris Eaton

Sample Description:
GW-8A
Analyzed: 09/16/04
Method: EPA 1625M

CONSTITUENT	PQL* ug/L	RESULT** ug/L
1,4-Dioxane	1.0	2.5
Percent Surrogate Recovery		138

ZymaX envirotechnology, inc. is certified by CA Department of Health Services: Laboratory #1717


*PQL - Practical Quantitation Limit

** Results listed as ND would have been reported if present at or above the listed PQL.

Note: Extracted by EPA 3510 on 09/15/04.

SA3926
MSD #6
37186-5d.xls
MN/jdm/sd/sk/kr

Submitted by,
ZymaX envirotechnology, inc.


Michael Ng
Assistant Lab Director



REPORT OF ANALYTICAL RESULTS

Client: Mick Cossairt
Deffenbaugh Industries, Inc
P.O. Box 3220
Shawnee, KS 66217

Lab Number: 37186-6
Collected: 09/09/04
Received: 09/11/04
Matrix: Aqueous

Project: ISC-KC
(QAS-KC)
Project Number:
Collected by: Chris Eaton

Sample Description:
GW-8B
Analyzed: 09/17/04
Method: EPA 1625M

CONSTITUENT	PQL* ug/L	RESULT** ug/L
1,4-Dioxane	1.0	26.
Percent Surrogate Recovery		104

ZymaX envirotechnology, inc. is certified by CA Department of Health Services: Laboratory #1717

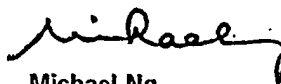
*PQL - Practical Quantitation Limit

**Results listed as ND would have been reported if present at or above the listed PQL.

Note: Extracted by EPA 3510 on 09/15/04.

SA3926
MSD #6
37186-6d.xls
MN/jdm/sd/cj/kr

Submitted by,
ZymaX envirotechnology, inc.


Michael Ng
Assistant Lab Director



REPORT OF ANALYTICAL RESULTS

Client: Mick Cossairt
Deffenbaugh Industries, Inc
P.O. Box 3220
Shawnee, KS 66217

Lab Number: 37186-7
Collected: 09/09/04
Received: 09/11/04
Matrix: Aqueous

Project: ISC-KC
(QAS-KC)
Project Number:
Collected by: Chris Eaton

Sample Description:
GW-9A
Analyzed: 09/17/04
Method: EPA 1625M

CONSTITUENT	PQL* ug/L	RESULT** ug/L
1,4-Dioxane	1.0	4.3
Percent Surrogate Recovery		92

ZymaX envirotechnology, inc. is certified by CA Department of Health Services: Laboratory #1717

*PQL - Practical Quantitation Limit

**Results listed as ND would have been reported if present at or above the listed PQL.

Note: Extracted by EPA 3510 on 09/15/04.

SA3926
MSD #6
37186-7d.xls
MN/jdm/sd/cj/kr

Submitted by,
ZymaX envirotechnology, inc.

Michael Ng
Assistant Lab Director



REPORT OF ANALYTICAL RESULTS

Client: Mick Cossairt
Deffenbaugh Industries, Inc
P.O. Box 3220
Shawnee, KS 66217

Lab Number: 37186-8
Collected: 09/09/04
Received: 09/11/04
Matrix: Aqueous

Project: ISC-KC
(QAS-KC)
Project Number:
Collected by: Chris Eaton

Sample Description:
GW-9B
Analyzed: 09/17/04
Method: EPA 1625M

CONSTITUENT	PQL* ug/L	RESULT** ug/L
1,4-Dioxane	1.0	32.
Percent Surrogate Recovery		113

ZymaX envirotechnology, inc. is certified by CA Department of Health Services: Laboratory #1717

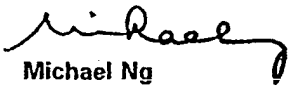
*PQL - Practical Quantitation Limit

**Results listed as ND would have been reported if present at or above the listed PQL.

Note: Extracted by EPA 3510 on 09/15/04.

SA3926
MSD #6
37186-8d.xls
MN/jdm/sd/cj/kr

Submitted by,
ZymaX envirotechnology, inc.


Michael Ng
Assistant Lab Director



REPORT OF ANALYTICAL RESULTS

Client: Mick Cossairt
Deffenbaugh Industries, Inc
P.O. Box 3220
Shawnee, KS 66217

Lab Number: 37186-9
Collected: 09/09/04
Received: 09/11/04
Matrix: Aqueous

Project: ISC-KC
(QAS-KC)
Project Number:
Collected by: Chris Eaton

Sample Description:
GW-10A
Analyzed: 09/17/04
Method: EPA 1625M

CONSTITUENT	PQL* ug/L	RESULT** ug/L
1,4-Dioxane	1.0	ND
Percent Surrogate Recovery		106

ZymaX envirotechnology, inc. is certified by CA Department of Health Services: Laboratory #1717

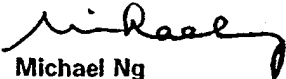
*PQL - Practical Quantitation Limit

**Results listed as ND would have been reported if present at or above the listed PQL.

Note: Extracted by EPA 3510 on 09/15/04.

SA3926
MSD #6
37186-9d.xls
MN/jdm/sd/cj/kr

Submitted by,
ZymaX envirotechnology, inc.


Michael Ng
Assistant Lab Director



REPORT OF ANALYTICAL RESULTS

Client: Mick Cossairt
Deffenbaugh Industries, Inc
P.O. Box 3220
Shawnee, KS 66217

Lab Number: 37186-10
Collected: 09/09/04
Received: 09/11/04
Matrix: Aqueous

Project: ISC-KC
(QAS-KC)
Project Number:
Collected by: Chris Eaton

Sample Description:
GW-10B
Analyzed: 09/17/04
Method: EPA 1625M

CONSTITUENT	PQL* ug/L	RESULT** ug/L
1,4-Dioxane	1.0	43.
Percent Surrogate Recovery		116

ZymaX envirotechnology, inc. is certified by CA Department of Health Services: Laboratory #1717

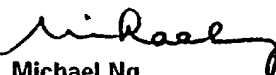
*PQL - Practical Quantitation Limit

**Results listed as ND would have been reported if present at or above the listed PQL.

Note: Extracted by EPA 3510 on 09/15/04.

SA3926
MSD #6
3718610d.xls
MN/jdm/sd/cj/kr

Submitted by,
ZymaX envirotechnology, inc.


Michael Ng
Assistant Lab Director



REPORT OF ANALYTICAL RESULTS

Client: Mick Cossairt
Deffenbaugh Industries, Inc
P.O. Box 3220
Shawnee, KS 66217

Lab Number: 37186-11
Collected: 09/08/04
Received: 09/11/04
Matrix: Aqueous

Project: ISC-KC
(QAS-KC)
Project Number:
Collected by: Chris Eaton

Sample Description:
GW-11A
Analyzed: 09/17/04
Method: EPA 1625M

CONSTITUENT	PQL* ug/L	RESULT** ug/L
1,4-Dioxane	1.0	4.7
Percent Surrogate Recovery		115

ZymaX envirotechnology, inc. is certified by CA Department of Health Services: Laboratory #1717


*PQL - Practical Quantitation Limit

**Results listed as ND would have been reported if present at or above the listed PQL.

Note: Extracted by EPA 3510 on 09/15/04.

SA3926
MSD #6
3718611d.xls
MN/jdm/sd/cj/kr

Submitted by,
ZymaX envirotechnology, inc.


Michael Ng
Assistant Lab Director



REPORT OF ANALYTICAL RESULTS

Client: Mick Cossairt
Deffenbaugh Industries, Inc
P.O. Box 3220
Shawnee, KS 66217

Lab Number: 37186-12
Collected: 09/08/04
Received: 09/11/04
Matrix: Aqueous

Project: ISC-KC
(QAS-KC)
Project Number:
Collected by: Chris Eaton

Sample Description:
GW-11B
Analyzed: 09/17/04
Method: EPA 1625M

CONSTITUENT	PQL* ug/L	RESULT** ug/L
1,4-Dioxane	1.0	36.
Percent Surrogate Recovery		119

ZymaX envirotechnology, inc. is certified by CA Department of Health Services: Laboratory #1717

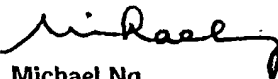
*PQL - Practical Quantitation Limit

**Results listed as ND would have been reported if present at or above the listed PQL.

Note: Extracted by EPA 3510 on 09/15/04.

SA3926
MSD #6
3718612d.xls
MN/jdm/sd/cj/kr

Submitted by,
ZymaX envirotechnology, inc.


Michael Ng
Assistant Lab Director



REPORT OF ANALYTICAL RESULTS

Client: Mick Cossairt
Deffenbaugh Industries, Inc
P.O. Box 3220
Shawnee, KS 66217

Lab Number: 37186-13
Collected: 09/09/04
Received: 09/11/04
Matrix: Aqueous

Project: ISC-KC
(QAS-KC)
Project Number:
Collected by: Chris Eaton

Sample Description:
Dup
Analyzed: 09/17/04
Method: EPA 1625M

CONSTITUENT	PQL* ug/L	RESULT** ug/L
1,4-Dioxane	1.0	38.
Percent Surrogate Recovery		121

ZymaX envirotechnology, inc. is certified by CA Department of Health Services: Laboratory #1717

*PQL - Practical Quantitation Limit

**Results listed as ND would have been reported if present at or above the listed PQL.

Note: Extracted by EPA 3510 on 09/15/04.

SA3926
MSD #6
3718613d.xls
MN/jdm/sd/cj/kr

Submitted by,
ZymaX envirotechnology, inc.

Michael Ng
Assistant Lab Director



REPORT OF ANALYTICAL RESULTS

Client: Mick Cossairt
Deffenbaugh Industries, Inc
P.O. Box 3220
Shawnee, KS 66217

Lab Number: 37186-14
Collected: 09/10/04
Received: 09/11/04
Matrix: Aqueous

Project: ISC-KC
(QAS-KC)
Project Number:
Collected by: Chris Eaton

Sample Description:
GW-12A
Analyzed: 09/17/04
Method: EPA 1625M

CONSTITUENT	PQL * ug/L	RESULT ** ug/L
1,4-Dioxane	1.0	ND
Percent Surrogate Recovery		128

ZymaX envirotechnology, inc. is certified by CA Department of Health Services: Laboratory #1717

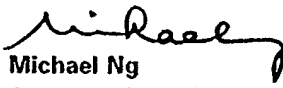
*PQL - Practical Quantitation Limit

**Results listed as ND would have been reported if present at or above the listed PQL.

Note: Extracted by EPA 3510 on 09/15/04.

SA3926
MSD #6
3718614d.xls
MN/jdm/sd/cj/kr

Submitted by,
ZymaX envirotechnology, inc.


Michael Ng
Assistant Lab Director



REPORT OF ANALYTICAL RESULTS

Client: Mick Cossairt
Deffenbaugh Industries, Inc
P.O. Box 3220
Shawnee, KS 66217

Lab Number: 37186-15
Collected: 09/10/04
Received: 09/11/04
Matrix: Aqueous

Project: ISC-KC
(QAS-KC)
Project Number:
Collected by: Chris Eaton

Sample Description:
GW-12B
Analyzed: 09/17/04
Method: EPA 1625M

CONSTITUENT	PQL* ug/L	RESULT** ug/L
1,4-Dioxane	1.0	13.
Percent Surrogate Recovery		122

ZymaX envirotechnology, inc. is certified by CA Department of Health Services: Laboratory #1717

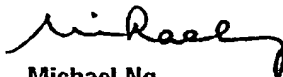
*PQL - Practical Quantitation Limit

**Results listed as ND would have been reported if present at or above the listed PQL.

Note: Extracted by EPA 3510 on 09/15/04.

SA3926
MSD #6
3718615d.xls
MN/jdm/sd/cj/kr

Submitted by,
ZymaX envirotechnology, inc.


Michael Ng
Assistant Lab Director



REPORT OF ANALYTICAL RESULTS

Client: Mick Cossairt
Deffenbaugh Industries, Inc
P.O. Box 3220
Shawnee, KS 66217

Lab Number: 37186-16
Collected: 09/10/04
Received: 09/11/04
Matrix: Aqueous

Project: ISC-KC
(QAS-KC)
Project Number:
Collected by: Chris Eaton

Sample Description:
GW-12C
Analyzed: 09/17/04
Method: EPA 1625M

CONSTITUENT	PQL* ug/L	RESULT** ug/L
1,4-Dioxane	1.0	34.
Percent Surrogate Recovery		125

ZymaX envirotechnology, inc. is certified by CA Department of Health Services: Laboratory #1717

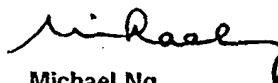
*PQL - Practical Quantitation Limit

**Results listed as ND would have been reported if present at or above the listed PQL.

Note: Extracted by EPA 3510 on 09/15/04.

SA3926
MSD #6
3718616d.xls
MN/jdm/sd/cj/kr

Submitted by,
ZymaX envirotechnology, inc.


Michael Ng
Assistant Lab Director



QUALITY ASSURANCE REPORT
SPIKE RESULTS

Client:

ZymaX envirotechnology, inc.
71 Zaca Lane, Suite 110
San Luis Obispo, CA 93401

Lab Number:

QS SA3926

Collected:

Received:

Matrix:

Aqueous

Project:

Project Number:

Collected by:

Sample Description:

Quality Assurance Spike

Analyzed:

09/17/04

Method:

EPA 1625M

CONSTITUENT	Amount Spiked ug/L	Amount Recovered ug/L	Percent Recovery
1,4-Dioxane	10.	9.77	98
Percent Surrogate Recovery			77

ZymaX envirotechnology, inc. is certified by CA Department of Health Services: Laboratory #1717

Note: Extracted by EPA 3510 on 09/16/04.

SA3926

MSD #6

SA3926q.xls

MN/jdm/sd/cj/ev

Submitted by,

ZymaX envirotechnology, inc.

Michael Ng

Assistant Lab Director



QUALITY ASSURANCE REPORT
SPIKE DUPLICATE RESULTS

Client:
ZymaX envirotechnology, inc.
71 Zaca Lane, Suite 110
San Luis Obispo, CA 93401

Lab Number: QSD SA3926
Collected:
Received:
Matrix: Aqueous

Project:
Project Number:
Collected by:

Sample Description:
Quality Assurance Spike Duplicate
Analyzed: 09/17/04
Method: EPA 1625M

CONSTITUENT	Amount Spiked ug/L	Amount Recovered ug/L	Percent Recovery	Relative Percent Difference*
1,4-Dioxane	10.	8.79	88	11
Percent Surrogate Recovery			111	

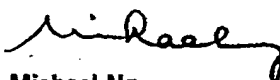
ZymaX envirotechnology, inc. is certified by CA Department of Health Services: Laboratory #1717

*Relative Percent Difference of the spike and spike duplicate

Note: Extracted by EPA 3510 on 09/16/04.

SA3926
MSD #6
SA3926q.xls
MN/jdm/sd/cj/ev

Submitted by,
ZymaX envirotechnology, inc.


Michael Ng
Assistant Lab Director



QUALITY ASSURANCE REPORT
BLANK RESULTS

Client:
ZymaX envirotechnology, inc.
71 Zaca Lane, Suite 110
San Luis Obispo, CA 93401

Lab Number: BLK SA3926
Collected:
Received:
Matrix: Aqueous

Project:

Project Number:
Collected by:

Sample Description:
Method Blank
Analyzed: 09/17/04
Method: EPA 1625M

CONSTITUENT	PQL* ug/L	RESULT** ug/L
1,4-Dioxane	1.0	ND
Percent Surrogate Recovery		100

ZymaX envirotechnology, inc. is certified by CA Department of Health Services: Laboratory #1717

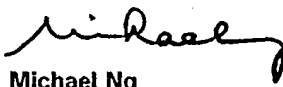
*PQL - Practical Quantitation Limit

**Results listed as ND would have been reported if present at or above the listed PQL.

Note: Extracted by EPA 3510 on 09/16/04.

SA3926
MSD #6
SA3926b.xls
MN/jdm/sd/cj/ev

Submitted by,
ZymaX envirotechnology, inc.


Michael Ng
Assistant Lab Director



ENVIRONMENTAL SCIENCE CORP.

12065 Lebanon Rd.
Mt. Juliet, TN 37122
(615) 758-5858
1-800-767-5859
Fax (615) 758-5859

Tax I.D. 62-0814289

Est. 1970

REPORT OF ANALYSIS

September 22, 2004

Mr. Mick Cossairt
Deffenbaugh Industries
18181 W. 53rd
Shawnee, KS 66203

Date Received : September 09, 2004
Description : ISC Oxbow Surface Water / Sediment
Sample ID : OX-1
Collected By :
Collection Date : 09/08/04 17:30

ESC Sample # : L168965-01

Site ID : OXBOW

Project # :

Parameter	Result	Det. Limit	Units	Method	Date	Dil.
Mercury	BDL	0.20	ug/l	7470A	09/14/04	1
Arsenic	BDL	10.	ug/l	6010B	09/18/04	1
Arsenic, Dissolved	BDL	10.	ug/l	6010B	09/16/04	1
Barium	160	5.0	ug/l	6010B	09/18/04	1
Barium, Dissolved	110	5.0	ug/l	6010B	09/16/04	1
Cadmium	BDL	5.0	ug/l	6010B	09/18/04	1
Cadmium, Dissolved	BDL	5.0	ug/l	6010B	09/16/04	1
Chromium	BDL	10.	ug/l	6010B	09/18/04	1
Chromium, Dissolved	BDL	10.	ug/l	6010B	09/16/04	1
Lead	7.7	5.0	ug/l	6010B	09/18/04	1
Lead, Dissolved	BDL	5.0	ug/l	6010B	09/17/04	1
Manganese	1700	10.	ug/l	6010B	09/18/04	1
Manganese, Dissolved	BDL	10.	ug/l	6010B	09/16/04	1
Nickel	BDL	10.	ug/l	6010B	09/18/04	1
Nickel, Dissolved	BDL	10.	ug/l	6010B	09/16/04	1
Selenium	11.	10.	ug/l	6010B	09/18/04	1
Selenium, Dissolved	11.	10.	ug/l	6010B	09/16/04	1
Silver	BDL	5.0	ug/l	6010B	09/18/04	1
Silver, Dissolved	BDL	5.0	ug/l	6010B	09/16/04	1
Volatile Organics						
Acetone	BDL	50.	ug/l	8260B	09/13/04	1
Acrolein	BDL	50.	ug/l	8260B	09/13/04	1
Acrylonitrile	BDL	50.	ug/l	8260B	09/13/04	1
Allyl chloride	BDL	50.	ug/l	8260B	09/13/04	1
Benzene	BDL	1.0	ug/l	8260B	09/13/04	1
Bromobenzene	BDL	1.0	ug/l	8260B	09/13/04	1
Bromochloromethane	BDL	1.0	ug/l	8260B	09/13/04	1
Bromodichloromethane	BDL	1.0	ug/l	8260B	09/13/04	1
Bromoform	BDL	1.0	ug/l	8260B	09/13/04	1
Bromomethane	BDL	1.0	ug/l	8260B	09/13/04	1
2-Butanone (MEK)	BDL	50.	ug/l	8260B	09/13/04	1
n-Butylbenzene	BDL	1.0	ug/l	8260B	09/13/04	1
sec-Butylbenzene	BDL	1.0	ug/l	8260B	09/13/04	1
tert-Butylbenzene	BDL	1.0	ug/l	8260B	09/13/04	1
Carbon disulfide	BDL	1.0	ug/l	8260B	09/13/04	1
Carbon tetrachloride	BDL	1.0	ug/l	8260B	09/13/04	1
Chlorobenzene	BDL	1.0	ug/l	8260B	09/13/04	1

BDL - Below Detection Limit

Det. Limit - Estimated Quantitation Limit (EQL)

Laboratory Certification Numbers:

AIHA - 100789, AL - 40660, CA - I-2327, CT - PH-0197, FL - E87487, GA - 923, IN - C-TN-01
KY - 90010, KYUST - 0016, NC - ENV375, DW21704, ND - R-140, SC - 84004, TN - 2006, VA - 00109, WV - 233



ENVIRONMENTAL SCIENCE CORP.

12065 Lebanon Rd.
Mt. Juliet, TN 37122
(615) 758-5858
1-800-767-5859
Fax (615) 758-5859

Tax I.D. 62-0814289

Est. 1970

REPORT OF ANALYSIS

Mr. Mick Cossairt
Deffenbaugh Industries
18181 W. 53rd
Shawnee, KS 66203

September 22, 2004

Date Received : September 09, 2004
Description : ISC Oxbow Surface Water / Sediment
Sample ID : OX-1
Collected By :
Collection Date : 09/08/04 17:30

ESC Sample # : L168965-01

Site ID : OXBOW

Project # :

Parameter	Result	Det. Limit	Units	Method	Date	Dil.
Chlorodibromomethane	BDL	1.0	ug/l	8260B	09/13/04	1
Chloroethane	BDL	1.0	ug/l	8260B	09/13/04	1
2-Chloroethyl vinyl ether	BDL	10.	ug/l	8260B	09/13/04	1
Chloroform	BDL	5.0	ug/l	8260B	09/13/04	1
Chloromethane	BDL	1.0	ug/l	8260B	09/13/04	1
2-Chlorotoluene	BDL	1.0	ug/l	8260B	09/13/04	1
4-Chlorotoluene	BDL	1.0	ug/l	8260B	09/13/04	1
1,2-Dibromo-3-Chloropropane	BDL	1.0	ug/l	8260B	09/13/04	1
1,2-Dibromoethane	BDL	1.0	ug/l	8260B	09/13/04	1
Dibromomethane	BDL	1.0	ug/l	8260B	09/13/04	1
1,2-Dichlorobenzene	BDL	1.0	ug/l	8260B	09/13/04	1
1,3-Dichlorobenzene	BDL	1.0	ug/l	8260B	09/13/04	1
1,4-Dichlorobenzene	BDL	1.0	ug/l	8260B	09/13/04	1
trans-1,4-Dichloro-2-butene	BDL	1.0	ug/l	8260B	09/13/04	1
Dichlorodifluoromethane	BDL	1.0	ug/l	8260B	09/13/04	1
1,1-Dichloroethane	BDL	1.0	ug/l	8260B	09/13/04	1
1,2-Dichloroethane	BDL	1.0	ug/l	8260B	09/13/04	1
1,1-Dichloroethene	BDL	1.0	ug/l	8260B	09/13/04	1
cis-1,2-Dichloroethene	BDL	1.0	ug/l	8260B	09/13/04	1
trans-1,2-Dichloroethene	BDL	1.0	ug/l	8260B	09/13/04	1
1,2-Dichloropropane	BDL	1.0	ug/l	8260B	09/13/04	1
1,3-Dichloropropane	BDL	1.0	ug/l	8260B	09/13/04	1
2,2-Dichloropropane	BDL	1.0	ug/l	8260B	09/13/04	1
1,1-Dichloropropene	BDL	1.0	ug/l	8260B	09/13/04	1
cis-1,3-Dichloropropene	BDL	1.0	ug/l	8260B	09/13/04	1
trans-1,3-Dichloropropene	BDL	1.0	ug/l	8260B	09/13/04	1
Di-isopropyl ether	BDL	1.0	ug/l	8260B	09/13/04	1
1,4-Dioxane	BDL	100	ug/l	8260B	09/13/04	1
Ethylbenzene	BDL	1.0	ug/l	8260B	09/13/04	1
Ethyl methacrylate	BDL	5.0	ug/l	8260B	09/13/04	1
Hexachlorobutadiene	BDL	1.0	ug/l	8260B	09/13/04	1
2-Hexanone	BDL	50.	ug/l	8260B	09/13/04	1
Iodomethane	BDL	50.	ug/l	8260B	09/13/04	1
Isopropylbenzene	BDL	1.0	ug/l	8260B	09/13/04	1
p-Isopropyltoluene	BDL	1.0	ug/l	8260B	09/13/04	1
Methacrylonitrile	BDL	50.	ug/l	8260B	09/13/04	1
Methylene Chloride	BDL	5.0	ug/l	8260B	09/13/04	1
Methyl methacrylate	BDL	50.	ug/l	8260B	09/13/04	1
4-Methyl-2-pentanone (MIBK)	BDL	50.	ug/l	8260B	09/13/04	1

BDL - Below Detection Limit

Det. Limit - Estimated Quantitation Limit (EQL)

Laboratory Certification Numbers:

AIHA - 100789, AL - 40660, CA - I-2327, CT- PH-0197, FL - E87487, GA - 923, IN - C-TN-01
KY - 90010, KYUST - 0016, NC - ENV375, DW21704, ND - R-140, SC - 84004, TN - 2006, VA - 00109, WV - 233



ENVIRONMENTAL
SCIENCE CORP.

12065 Lebanon Rd.
Mt. Juliet, TN 37122
(615) 758-5858
1-800-767-5859
Fax (615) 758-5859

Tax I.D. 62-0814289

Est. 1970

REPORT OF ANALYSIS

Mr. Mick Cossairt
Deffenbaugh Industries
18181 W. 53rd
Shawnee, KS 66203

September 22, 2004

Date Received : September 09, 2004
Description : ISC Oxbow Surface Water / Sediment
Sample ID : OX-1
Collected By :
Collection Date : 09/08/04 17:30

ESC Sample # : L168965-01

Site ID : OXBOW

Project # :

Parameter	Result	Det. Limit	Units	Method	Date	Dil.
Methyl tert-butyl ether	BDL	1.0	ug/l	8260B	09/13/04	1
Naphthalene	BDL	5.0	ug/l	8260B	09/13/04	1
Pentachloroethane	BDL	50.	ug/l	8260B	09/13/04	1
Propionitrile	BDL	50.	ug/l	8260B	09/13/04	1
n-Propylbenzene	BDL	1.0	ug/l	8260B	09/13/04	1
Styrene	BDL	1.0	ug/l	8260B	09/13/04	1
1,1,2,2-Tetrachloroethane	BDL	1.0	ug/l	8260B	09/13/04	1
1,1,1,2-Tetrachloroethane	BDL	1.0	ug/l	8260B	09/13/04	1
Tetrachloroethene	BDL	1.0	ug/l	8260B	09/13/04	1
Toluene	BDL	5.0	ug/l	8260B	09/13/04	1
1,2,3-Trichlorobenzene	BDL	1.0	ug/l	8260B	09/13/04	1
1,2,4-Trichlorobenzene	BDL	1.0	ug/l	8260B	09/13/04	1
1,1,1-Trichloroethane	BDL	1.0	ug/l	8260B	09/13/04	1
1,1,2-Trichloroethane	BDL	1.0	ug/l	8260B	09/13/04	1
Trichloroethene	BDL	1.0	ug/l	8260B	09/13/04	1
Trichlorofluoromethane	BDL	1.0	ug/l	8260B	09/13/04	1
1,2,3-Trichloropropane	BDL	1.0	ug/l	8260B	09/13/04	1
1,2,4-Trimethylbenzene	BDL	1.0	ug/l	8260B	09/13/04	1
1,3,5-Trimethylbenzene	BDL	1.0	ug/l	8260B	09/13/04	1
Vinyl chloride	BDL	1.0	ug/l	8260B	09/13/04	1
Xylenes, Total	BDL	3.0	ug/l	8260B	09/13/04	1
Surrogate Recovery						
Toluene-d8	100		% Rec.	8260B	09/13/04	1
Dibromofluoromethane	100		% Rec.	8260B	09/13/04	1
4-Bromofluorobenzene	100		% Rec.	8260B	09/13/04	1

Tom Mellette, ESC Representative

BDL - Below Detection Limit

Det. Limit - Estimated Quantitation Limit (EQL)

Laboratory Certification Numbers:

AIHA - 100789, AL - 40660, CA - I-2327, CT- PH-0197, FL - E87487, GA - 923, IN - C-TN-01
KY - 90010, KYUST - 0016, NC - ENV375, DW21704, ND - R-140, SC - 84004, TN - 2006, VA - 00109, WV - 233

Note:

The reported analytical results relate only to the sample submitted.

This report shall not be reproduced, except in full, without the written approval from ESC.

Reported: 09/20/04 16:50 Printed: 09/22/04 07:54



ENVIRONMENTAL SCIENCE CORP.

12065 Lebanon Rd.
Mt. Juliet, TN 37122
(615) 758-5858
1-800-767-5859
Fax (615) 758-5859

Tax I.D. 62-0814289

Est. 1970

REPORT OF ANALYSIS

Mr. Mick Cossairt
Deffenbaugh Industries
18181 W. 53rd
Shawnee, KS 66203

September 22, 2004

Date Received : September 09, 2004
Description : ISC Oxbow Surface Water / Sediment
Sample ID : OX-2
Collected By :
Collection Date : 09/08/04 17:10

ESC Sample # : L168965-02

Site ID : OXBOW

Project # :

Parameter	Result	Det. Limit	Units	Method	Date	Dil.
Mercury	BDL	0.20	ug/l	7470A	09/14/04	1
Arsenic	BDL	10.	ug/l	6010B	09/18/04	1
Arsenic, Dissolved	BDL	10.	ug/l	6010B	09/16/04	1
Barium	110	5.0	ug/l	6010B	09/18/04	1
Barium, Dissolved	100	5.0	ug/l	6010B	09/16/04	1
Cadmium	BDL	5.0	ug/l	6010B	09/18/04	1
Cadmium, Dissolved	BDL	5.0	ug/l	6010B	09/16/04	1
Chromium	BDL	10.	ug/l	6010B	09/18/04	1
Chromium, Dissolved	BDL	10.	ug/l	6010B	09/16/04	1
Lead	BDL	5.0	ug/l	6010B	09/18/04	1
Lead, Dissolved	BDL	5.0	ug/l	6010B	09/17/04	1
Manganese	340	10.	ug/l	6010B	09/18/04	1
Manganese, Dissolved	BDL	10.	ug/l	6010B	09/16/04	1
Nickel	BDL	10.	ug/l	6010B	09/18/04	1
Nickel, Dissolved	BDL	10.	ug/l	6010B	09/16/04	1
Selenium	BDL	10.	ug/l	6010B	09/18/04	1
Selenium, Dissolved	BDL	10.	ug/l	6010B	09/16/04	1
Silver	BDL	5.0	ug/l	6010B	09/18/04	1
Silver, Dissolved	BDL	5.0	ug/l	6010B	09/16/04	1
Volatile Organics						
Acetone	BDL	50.	ug/l	8260B	09/13/04	1
Acrolein	BDL	50.	ug/l	8260B	09/13/04	1
Acrylonitrile	BDL	50.	ug/l	8260B	09/13/04	1
Allyl chloride	BDL	50.	ug/l	8260B	09/13/04	1
Benzene	BDL	1.0	ug/l	8260B	09/13/04	1
Bromobenzene	BDL	1.0	ug/l	8260B	09/13/04	1
Bromochloromethane	BDL	1.0	ug/l	8260B	09/13/04	1
Bromodichloromethane	BDL	1.0	ug/l	8260B	09/13/04	1
Bromoform	BDL	1.0	ug/l	8260B	09/13/04	1
Bromomethane	BDL	1.0	ug/l	8260B	09/13/04	1
2-Butanone (MEK)	BDL	50.	ug/l	8260B	09/13/04	1
n-Butylbenzene	BDL	1.0	ug/l	8260B	09/13/04	1
sec-Butylbenzene	BDL	1.0	ug/l	8260B	09/13/04	1
tert-Butylbenzene	BDL	1.0	ug/l	8260B	09/13/04	1
Carbon disulfide	BDL	1.0	ug/l	8260B	09/13/04	1
Carbon tetrachloride	BDL	1.0	ug/l	8260B	09/13/04	1
Chlorobenzene	BDL	1.0	ug/l	8260B	09/13/04	1

BDL - Below Detection Limit

Det. Limit - Estimated Quantitation Limit (EQL)

Laboratory Certification Numbers:

AIHA - 100789, AL - 40660, CA - I-2327, CT - PH-0197, FL - E87487, GA - 923, IN - C-TN-01
KY - 90010, KYUST - 0016, NC - ENV375, DW21704, ND - R-140, SC - 84004, TN - 2006, VA - 00109, WV - 233



ENVIRONMENTAL SCIENCE CORP.

12065 Lebanon Rd.
Mt. Juliet, TN 37122
(615) 758-5858
1-800-767-5859
Fax (615) 758-5859

Tax I.D. 62-0814289

Est. 1970

REPORT OF ANALYSIS

Mr. Mick Cossairt
Deffenbaugh Industries
18181 W. 53rd
Shawnee, KS 66203

September 22, 2004

Date Received : September 09, 2004
Description : ISC Oxbow Surface Water / Sediment
Sample ID : OX-2
Collected By :
Collection Date : 09/08/04 17:10

ESC Sample # : L168965-02

Site ID : OXBOW

Project # :

Parameter	Result	Det. Limit	Units	Method	Date	Dil.
Chlorodibromomethane	BDL	1.0	ug/l	8260B	09/13/04	1
Chloroethane	BDL	1.0	ug/l	8260B	09/13/04	1
2-Chloroethyl vinyl ether	BDL	10.	ug/l	8260B	09/13/04	1
Chloroform	BDL	5.0	ug/l	8260B	09/13/04	1
Chloromethane	BDL	1.0	ug/l	8260B	09/13/04	1
2-Chlorotoluene	BDL	1.0	ug/l	8260B	09/13/04	1
4-Chlorotoluene	BDL	1.0	ug/l	8260B	09/13/04	1
1,2-Dibromo-3-Chloropropane	BDL	1.0	ug/l	8260B	09/13/04	1
1,2-Dibromoethane	BDL	1.0	ug/l	8260B	09/13/04	1
Dibromomethane	BDL	1.0	ug/l	8260B	09/13/04	1
1,2-Dichlorobenzene	BDL	1.0	ug/l	8260B	09/13/04	1
1,3-Dichlorobenzene	BDL	1.0	ug/l	8260B	09/13/04	1
1,4-Dichlorobenzene	BDL	1.0	ug/l	8260B	09/13/04	1
trans-1,4-Dichloro-2-butene	BDL	1.0	ug/l	8260B	09/13/04	1
Dichlorodifluoromethane	BDL	1.0	ug/l	8260B	09/13/04	1
1,1-Dichloroethane	BDL	1.0	ug/l	8260B	09/13/04	1
1,2-Dichloroethane	BDL	1.0	ug/l	8260B	09/13/04	1
1,1-Dichloroethene	BDL	1.0	ug/l	8260B	09/13/04	1
cis-1,2-Dichloroethene	BDL	1.0	ug/l	8260B	09/13/04	1
trans-1,2-Dichloroethene	BDL	1.0	ug/l	8260B	09/13/04	1
1,2-Dichloropropane	BDL	1.0	ug/l	8260B	09/13/04	1
1,3-Dichloropropane	BDL	1.0	ug/l	8260B	09/13/04	1
2,2-Dichloropropane	BDL	1.0	ug/l	8260B	09/13/04	1
1,1-Dichloropropene	BDL	1.0	ug/l	8260B	09/13/04	1
cis-1,3-Dichloropropene	BDL	1.0	ug/l	8260B	09/13/04	1
trans-1,3-Dichloropropene	BDL	1.0	ug/l	8260B	09/13/04	1
Di-isopropyl ether	BDL	1.0	ug/l	8260B	09/13/04	1
1,4-Dioxane	BDL	100	ug/l	8260B	09/13/04	1
Ethylbenzene	BDL	1.0	ug/l	8260B	09/13/04	1
Ethyl methacrylate	BDL	5.0	ug/l	8260B	09/13/04	1
Hexachlorobutadiene	BDL	1.0	ug/l	8260B	09/13/04	1
2-Hexanone	BDL	50.	ug/l	8260B	09/13/04	1
Iodomethane	BDL	50.	ug/l	8260B	09/13/04	1
Isopropylbenzene	BDL	1.0	ug/l	8260B	09/13/04	1
p-Isopropyltoluene	BDL	1.0	ug/l	8260B	09/13/04	1
Methacrylonitrile	BDL	50.	ug/l	8260B	09/13/04	1
Methylene Chloride	BDL	5.0	ug/l	8260B	09/13/04	1
Methyl methacrylate	BDL	50.	ug/l	8260B	09/13/04	1
4-Methyl-2-pentanone (MIBK)	BDL	50.	ug/l	8260B	09/13/04	1

BDL - Below Detection Limit

Det. Limit - Estimated Quantitation Limit (EQL)

Laboratory Certification Numbers:

AIHA - 100789, AL - 40660, CA - I-2327, CT- PH-0197, FL - E87487, GA - 923, IN - C-TN-01
KY - 90010, KYUST - 0016, NC - ENV375, DW21704, ND - R-140, SC - 84004, TN - 2006, VA - 00109, WV - 233



ENVIRONMENTAL
SCIENCE CORP.

12065 Lebanon Rd.
Mt. Juliet, TN 37122
(615) 758-5858
1-800-767-5859
Fax (615) 758-5859

Tax I.D. 62-0814289

Est. 1970

REPORT OF ANALYSIS

Mr. Mick Cossairt
Deffenbaugh Industries
18181 W. 53rd
Shawnee, KS 66203

September 22, 2004

Date Received : September 09, 2004
Description : ISC Oxbow Surface Water / Sediment
Sample ID : OX-2
Collected By :
Collection Date : 09/08/04 17:10

ESC Sample # : L168965-02

Site ID : OXBOW

Project # :

Parameter	Result	Det. Limit	Units	Method	Date	Dil.
Methyl tert-butyl ether	BDL	1.0	ug/l	8260B	09/13/04	1
Naphthalene	BDL	5.0	ug/l	8260B	09/13/04	1
Pentachloroethane	BDL	50.	ug/l	8260B	09/13/04	1
Propionitrile	BDL	50.	ug/l	8260B	09/13/04	1
n-Propylbenzene	BDL	1.0	ug/l	8260B	09/13/04	1
Styrene	BDL	1.0	ug/l	8260B	09/13/04	1
1,1,2,2-Tetrachloroethane	BDL	1.0	ug/l	8260B	09/13/04	1
1,1,1,2-Tetrachloroethane	BDL	1.0	ug/l	8260B	09/13/04	1
Tetrachloroethene	BDL	1.0	ug/l	8260B	09/13/04	1
Toluene	BDL	5.0	ug/l	8260B	09/13/04	1
1,2,3-Trichlorobenzene	BDL	1.0	ug/l	8260B	09/13/04	1
1,2,4-Trichlorobenzene	BDL	1.0	ug/l	8260B	09/13/04	1
1,1,1-Trichloroethane	BDL	1.0	ug/l	8260B	09/13/04	1
1,1,2-Trichloroethane	BDL	1.0	ug/l	8260B	09/13/04	1
Trichloroethene	BDL	1.0	ug/l	8260B	09/13/04	1
Trichlorofluoromethane	BDL	1.0	ug/l	8260B	09/13/04	1
1,2,3-Trichloropropane	BDL	1.0	ug/l	8260B	09/13/04	1
1,2,4-Trimethylbenzene	BDL	1.0	ug/l	8260B	09/13/04	1
1,3,5-Trimethylbenzene	BDL	1.0	ug/l	8260B	09/13/04	1
Vinyl chloride	BDL	1.0	ug/l	8260B	09/13/04	1
Xylenes, Total	BDL	3.0	ug/l	8260B	09/13/04	1
Surrogate Recovery						
Toluene-d8	100		% Rec.	8260B	09/13/04	1
Dibromofluoromethane	100		% Rec.	8260B	09/13/04	1
4-Bromofluorobenzene	100		% Rec.	8260B	09/13/04	1

Tom Mellette, ESC Representative

BDL - Below Detection Limit

Det. Limit - Estimated Quantitation Limit (EQL)

Laboratory Certification Numbers:

AIHA - 100789, AL - 40660, CA - I-2327, CT- PH-0197, FL - E87487, GA - 923, IN - C-TN-01
KY - 90010, KYUST - 0016, NC - ENV375, DW21704, ND - R-140, SC - 84004, TN - 2006, VA - 00109, WV - 233

Note:

The reported analytical results relate only to the sample submitted.

This report shall not be reproduced, except in full, without the written approval from ESC.

Reported: 09/20/04 16:50 Printed: 09/22/04 07:54



ENVIRONMENTAL SCIENCE CORP.

12065 Lebanon Rd.
Mt. Juliet, TN 37122
(615) 758-5858
1-800-767-5859
Fax (615) 758-5859

Tax I.D. 62-0814289

Est. 1970

REPORT OF ANALYSIS

Mr. Mick Cossairt
Deffenbaugh Industries
18181 W. 53rd
Shawnee, KS 66203

September 22, 2004

Date Received : September 09, 2004
Description : ISC Oxbow Surface Water / Sediment
Sample ID : OX-3
Collected By :
Collection Date : 09/08/04 16:15

ESC Sample # : L168965-03

Site ID : OXBOW

Project # :

Parameter	Result	Det. Limit	Units	Method	Date	Dil.
Mercury	BDL	0.20	ug/l	7470A	09/14/04	1
Arsenic	BDL	10.	ug/l	6010B	09/18/04	1
Arsenic, Dissolved	BDL	10.	ug/l	6010B	09/16/04	1
Barium	120	5.0	ug/l	6010B	09/18/04	1
Barium, Dissolved	110	5.0	ug/l	6010B	09/16/04	1
Cadmium	BDL	5.0	ug/l	6010B	09/18/04	1
Cadmium, Dissolved	BDL	5.0	ug/l	6010B	09/16/04	1
Chromium	BDL	10.	ug/l	6010B	09/18/04	1
Chromium, Dissolved	BDL	10.	ug/l	6010B	09/16/04	1
Lead	BDL	5.0	ug/l	6010B	09/18/04	1
Lead, Dissolved	BDL	5.0	ug/l	6010B	09/17/04	1
Manganese	440	10.	ug/l	6010B	09/18/04	1
Manganese, Dissolved	BDL	10.	ug/l	6010B	09/16/04	1
Nickel	BDL	10.	ug/l	6010B	09/18/04	1
Nickel, Dissolved	BDL	10.	ug/l	6010B	09/16/04	1
Selenium	BDL	10.	ug/l	6010B	09/18/04	1
Selenium, Dissolved	BDL	10.	ug/l	6010B	09/16/04	1
Silver	BDL	5.0	ug/l	6010B	09/18/04	1
Silver, Dissolved	BDL	5.0	ug/l	6010B	09/16/04	1
Volatile Organics						
Acetone	BDL	50.	ug/l	8260B	09/13/04	1
Acrolein	BDL	50.	ug/l	8260B	09/13/04	1
Acrylonitrile	BDL	50.	ug/l	8260B	09/13/04	1
Allyl chloride	BDL	50.	ug/l	8260B	09/13/04	1
Benzene	BDL	1.0	ug/l	8260B	09/13/04	1
Bromobenzene	BDL	1.0	ug/l	8260B	09/13/04	1
Bromochloromethane	BDL	1.0	ug/l	8260B	09/13/04	1
Bromodichloromethane	BDL	1.0	ug/l	8260B	09/13/04	1
Bromoform	BDL	1.0	ug/l	8260B	09/13/04	1
Bromomethane	BDL	1.0	ug/l	8260B	09/13/04	1
2-Butanone (MEK)	BDL	50.	ug/l	8260B	09/13/04	1
n-Butylbenzene	BDL	1.0	ug/l	8260B	09/13/04	1
sec-Butylbenzene	BDL	1.0	ug/l	8260B	09/13/04	1
tert-Butylbenzene	BDL	1.0	ug/l	8260B	09/13/04	1
Carbon disulfide	BDL	1.0	ug/l	8260B	09/13/04	1
Carbon tetrachloride	BDL	1.0	ug/l	8260B	09/13/04	1
Chlorobenzene	BDL	1.0	ug/l	8260B	09/13/04	1

BDL - Below Detection Limit

Det. Limit - Estimated Quantitation Limit (EQL)

Laboratory Certification Numbers:

AIHA - 100789, AL - 40660, CA - I-2327, CT - PH-0197, FL - E87487, GA - 923, IN - C-TN-01
KY - 90010, KYUST - 0016, NC - ENV375, DW21704, ND - R-140, SC - 84004, TN - 2006, VA - 00109, WV - 233



ENVIRONMENTAL SCIENCE CORP.

12065 Lebanon Rd.
Mt. Juliet, TN 37122
(615) 758-5858
1-800-767-5859
Fax (615) 758-5859

Tax I.D. 62-0814289

Est. 1970

REPORT OF ANALYSIS

September 22, 2004

Mr. Mick Cossairt
Deffenbaugh Industries
18181 W. 53rd
Shawnee, KS 66203

Date Received : September 09, 2004
Description : ISC Oxbow Surface Water / Sediment
Sample ID : OX-3
Collected By :
Collection Date : 09/08/04 16:15

ESC Sample # : L168965-03

Site ID : OXBOW

Project # :

Parameter	Result	Det. Limit	Units	Method	Date	Dil.
Chlorodibromomethane	BDL	1.0	ug/l	8260B	09/13/04	1
Chloroethane	BDL	1.0	ug/l	8260B	09/13/04	1
2-Chloroethyl vinyl ether	BDL	10.	ug/l	8260B	09/13/04	1
Chloroform	BDL	5.0	ug/l	8260B	09/13/04	1
Chloromethane	BDL	1.0	ug/l	8260B	09/13/04	1
2-Chlorotoluene	BDL	1.0	ug/l	8260B	09/13/04	1
4-Chlorotoluene	BDL	1.0	ug/l	8260B	09/13/04	1
1,2-Dibromo-3-Chloropropane	BDL	1.0	ug/l	8260B	09/13/04	1
1,2-Dibromoethane	BDL	1.0	ug/l	8260B	09/13/04	1
Dibromomethane	BDL	1.0	ug/l	8260B	09/13/04	1
1,2-Dichlorobenzene	BDL	1.0	ug/l	8260B	09/13/04	1
1,3-Dichlorobenzene	BDL	1.0	ug/l	8260B	09/13/04	1
1,4-Dichlorobenzene	BDL	1.0	ug/l	8260B	09/13/04	1
trans-1,4-Dichloro-2-butene	BDL	1.0	ug/l	8260B	09/13/04	1
Dichlorodifluoromethane	BDL	1.0	ug/l	8260B	09/13/04	1
1,1-Dichloroethane	BDL	1.0	ug/l	8260B	09/13/04	1
1,2-Dichloroethane	BDL	1.0	ug/l	8260B	09/13/04	1
1,1-Dichloroethene	BDL	1.0	ug/l	8260B	09/13/04	1
cis-1,2-Dichloroethene	BDL	1.0	ug/l	8260B	09/13/04	1
trans-1,2-Dichloroethene	BDL	1.0	ug/l	8260B	09/13/04	1
1,2-Dichloropropane	BDL	1.0	ug/l	8260B	09/13/04	1
1,3-Dichloropropane	BDL	1.0	ug/l	8260B	09/13/04	1
2,2-Dichloropropane	BDL	1.0	ug/l	8260B	09/13/04	1
1,1-Dichloropropene	BDL	1.0	ug/l	8260B	09/13/04	1
cis-1,3-Dichloropropene	BDL	1.0	ug/l	8260B	09/13/04	1
trans-1,3-Dichloropropene	BDL	1.0	ug/l	8260B	09/13/04	1
Di-isopropyl ether	BDL	1.0	ug/l	8260B	09/13/04	1
1,4-Dioxane	BDL	100	ug/l	8260B	09/13/04	1
Ethylbenzene	BDL	1.0	ug/l	8260B	09/13/04	1
Ethyl methacrylate	BDL	5.0	ug/l	8260B	09/13/04	1
Hexachlorobutadiene	BDL	1.0	ug/l	8260B	09/13/04	1
2-Hexanone	BDL	50.	ug/l	8260B	09/13/04	1
Iodomethane	BDL	50.	ug/l	8260B	09/13/04	1
Isopropylbenzene	BDL	1.0	ug/l	8260B	09/13/04	1
p-Isopropyltoluene	BDL	1.0	ug/l	8260B	09/13/04	1
Methacrylonitrile	BDL	50.	ug/l	8260B	09/13/04	1
Methylene Chloride	BDL	5.0	ug/l	8260B	09/13/04	1
Methyl methacrylate	BDL	50.	ug/l	8260B	09/13/04	1
4-Methyl-2-pentanone (MIBK)	BDL	50.	ug/l	8260B	09/13/04	1

BDL - Below Detection Limit

Det. Limit - Estimated Quantitation Limit (EQL)

Laboratory Certification Numbers:

AIHA - 100789, AL - 40660, CA - I-2327, CT- PH-0197, FL - E87487, GA - 923, IN - C-TN-01
KY - 90010, KYUST - 0016, NC - ENV375, DW21704, ND - R-140, SC - 84004, TN - 2006, VA - 00109, WV - 233



ENVIRONMENTAL
SCIENCE CORP.

12065 Lebanon Rd.
Mt. Juliet, TN 37122
(615) 758-5858
1-800-767-5859
Fax (615) 758-5859

Tax I.D. 62-0814289

Est. 1970

REPORT OF ANALYSIS

Mr. Mick Cossairt
Deffenbaugh Industries
18181 W. 53rd
Shawnee, KS 66203

September 22, 2004

Date Received : September 09, 2004
Description : ISC Oxbow Surface Water / Sediment
Sample ID : OX-3
Collected By :
Collection Date : 09/08/04 16:15

ESC Sample # : L168965-03

Site ID : OXBOW

Project # :

Parameter	Result	Det. Limit	Units	Method	Date	Dil.
Methyl tert-butyl ether	BDL	1.0	ug/l	8260B	09/13/04	1
Naphthalene	BDL	5.0	ug/l	8260B	09/13/04	1
Pentachloroethane	BDL	50.	ug/l	8260B	09/13/04	1
Propionitrile	BDL	50.	ug/l	8260B	09/13/04	1
n-Propylbenzene	BDL	1.0	ug/l	8260B	09/13/04	1
Styrene	BDL	1.0	ug/l	8260B	09/13/04	1
1,1,2,2-Tetrachloroethane	BDL	1.0	ug/l	8260B	09/13/04	1
1,1,1,2-Tetrachloroethane	BDL	1.0	ug/l	8260B	09/13/04	1
Tetrachloroethene	BDL	1.0	ug/l	8260B	09/13/04	1
Toluene	BDL	5.0	ug/l	8260B	09/13/04	1
1,2,3-Trichlorobenzene	BDL	1.0	ug/l	8260B	09/13/04	1
1,2,4-Trichlorobenzene	BDL	1.0	ug/l	8260B	09/13/04	1
1,1,1-Trichloroethane	BDL	1.0	ug/l	8260B	09/13/04	1
1,1,2-Trichloroethane	BDL	1.0	ug/l	8260B	09/13/04	1
Trichloroethene	BDL	1.0	ug/l	8260B	09/13/04	1
Trichlorofluoromethane	BDL	1.0	ug/l	8260B	09/13/04	1
1,2,3-Trichloropropane	BDL	1.0	ug/l	8260B	09/13/04	1
1,2,4-Trimethylbenzene	BDL	1.0	ug/l	8260B	09/13/04	1
1,3,5-Trimethylbenzene	BDL	1.0	ug/l	8260B	09/13/04	1
Vinyl chloride	BDL	1.0	ug/l	8260B	09/13/04	1
Xylenes, Total	BDL	3.0	ug/l	8260B	09/13/04	1
Surrogate Recovery						
Toluene-d8	100		% Rec.	8260B	09/13/04	1
Dibromofluoromethane	100		% Rec.	8260B	09/13/04	1
4-Bromofluorobenzene	100		% Rec.	8260B	09/13/04	1

Tom Mellette, ESC Representative

BDL - Below Detection Limit

Det. Limit - Estimated Quantitation Limit (EQL)

Laboratory Certification Numbers:

AIHA - 100789, AL - 40660, CA - I-2327, CT- PH-0197, FL - E87487, GA - 923, IN - C-TN-01
KY - 90010, KYUST - 0016, NC - ENV375, DW21704, ND - R-140, SC - 84004, TN - 2006, VA - 00109, WV - 233

Note:

The reported analytical results relate only to the sample submitted.

This report shall not be reproduced, except in full, without the written approval from ESC.

Reported: 09/20/04 16:50 Printed: 09/22/04 07:54



ENVIRONMENTAL SCIENCE CORP.

12065 Lebanon Rd.
Mt. Juliet, TN 37122
(615) 758-5858
1-800-767-5859
Fax (615) 758-5859

Tax I.D. 62-0814289

Est. 1970

REPORT OF ANALYSIS

Mr. Mick Cossairt
Deffenbaugh Industries
18181 W. 53rd
Shawnee, KS 66203

September 22, 2004

Date Received : September 09, 2004
Description : ISC Oxbow Surface Water / Sediment
Sample ID : OX-4
Collected By :
Collection Date : 09/08/04 15:40

ESC Sample # : L168965-04

Site ID : OXBOW

Project # :

Parameter	Result	Det. Limit	Units	Method	Date	Dil.
Mercury	BDL	0.20	ug/l	7470A	09/14/04	1
Arsenic	BDL	10.	ug/l	6010B	09/18/04	1
Arsenic, Dissolved	BDL	10.	ug/l	6010B	09/16/04	1
Barium	110	5.0	ug/l	6010B	09/18/04	1
Barium, Dissolved	110	5.0	ug/l	6010B	09/16/04	1
Cadmium	BDL	5.0	ug/l	6010B	09/18/04	1
Cadmium, Dissolved	BDL	5.0	ug/l	6010B	09/16/04	1
Chromium	BDL	10.	ug/l	6010B	09/18/04	1
Chromium, Dissolved	BDL	10.	ug/l	6010B	09/16/04	1
Lead	BDL	5.0	ug/l	6010B	09/18/04	1
Lead, Dissolved	BDL	5.0	ug/l	6010B	09/17/04	1
Manganese	480	10.	ug/l	6010B	09/18/04	1
Manganese, Dissolved	BDL	10.	ug/l	6010B	09/16/04	1
Nickel	BDL	10.	ug/l	6010B	09/18/04	1
Nickel, Dissolved	BDL	10.	ug/l	6010B	09/16/04	1
Selenium	17.	10.	ug/l	6010B	09/18/04	1
Selenium, Dissolved	11.	10.	ug/l	6010B	09/16/04	1
Silver	BDL	5.0	ug/l	6010B	09/18/04	1
Silver, Dissolved	BDL	5.0	ug/l	6010B	09/16/04	1
Volatile Organics						
Acetone	BDL	50.	ug/l	8260B	09/13/04	1
Acrolein	BDL	50.	ug/l	8260B	09/13/04	1
Acrylonitrile	BDL	50.	ug/l	8260B	09/13/04	1
Allyl chloride	BDL	50.	ug/l	8260B	09/13/04	1
Benzene	BDL	1.0	ug/l	8260B	09/13/04	1
Bromobenzene	BDL	1.0	ug/l	8260B	09/13/04	1
Bromochloromethane	BDL	1.0	ug/l	8260B	09/13/04	1
Bromodichloromethane	BDL	1.0	ug/l	8260B	09/13/04	1
Bromoform	BDL	1.0	ug/l	8260B	09/13/04	1
Bromomethane	BDL	1.0	ug/l	8260B	09/13/04	1
2-Butanone (MEK)	BDL	50.	ug/l	8260B	09/13/04	1
n-Butylbenzene	BDL	1.0	ug/l	8260B	09/13/04	1
sec-Butylbenzene	BDL	1.0	ug/l	8260B	09/13/04	1
tert-Butylbenzene	BDL	1.0	ug/l	8260B	09/13/04	1
Carbon disulfide	BDL	1.0	ug/l	8260B	09/13/04	1
Carbon tetrachloride	BDL	1.0	ug/l	8260B	09/13/04	1
Chlorobenzene	BDL	1.0	ug/l	8260B	09/13/04	1

BDL - Below Detection Limit

Det. Limit - Estimated Quantitation Limit (EQL)

Laboratory Certification Numbers:

AIHA - 100789, AL - 40660, CA - I-2327, CT- PH-0197, FL - E87487, GA - 923, IN - C-TN-01
KY - 90010, KYUST - 0016, NC - ENV375, DW21704, ND - R-140, SC - 84004, TN - 2006, VA - 00109, WV - 233



ENVIRONMENTAL SCIENCE CORP.

12065 Lebanon Rd.
Mt. Juliet, TN 37122
(615) 758-5858
1-800-767-5859
Fax (615) 758-5859

Tax I.D. 62-0814289

Est. 1970

REPORT OF ANALYSIS

Mr. Mick Cossairt
Deffenbaugh Industries
18181 W. 53rd
Shawnee, KS 66203

September 22, 2004

Date Received : September 09, 2004
Description : ISC Oxbow Surface Water / Sediment
Sample ID : OX-4
Collected By :
Collection Date : 09/08/04 15:40

ESC Sample # : L168965-04

Site ID : OXBOW

Project # :

Parameter	Result	Det. Limit	Units	Method	Date	Dil.
Chlorodibromomethane	BDL	1.0	ug/l	8260B	09/13/04	1
Chloroethane	BDL	1.0	ug/l	8260B	09/13/04	1
2-Chloroethyl vinyl ether	BDL	10.	ug/l	8260B	09/13/04	1
Chloroform	BDL	5.0	ug/l	8260B	09/13/04	1
Chloromethane	BDL	1.0	ug/l	8260B	09/13/04	1
2-Chlorotoluene	BDL	1.0	ug/l	8260B	09/13/04	1
4-Chlorotoluene	BDL	1.0	ug/l	8260B	09/13/04	1
1,2-Dibromo-3-Chloropropane	BDL	1.0	ug/l	8260B	09/13/04	1
1,2-Dibromoethane	BDL	1.0	ug/l	8260B	09/13/04	1
Dibromomethane	BDL	1.0	ug/l	8260B	09/13/04	1
1,2-Dichlorobenzene	BDL	1.0	ug/l	8260B	09/13/04	1
1,3-Dichlorobenzene	BDL	1.0	ug/l	8260B	09/13/04	1
1,4-Dichlorobenzene	BDL	1.0	ug/l	8260B	09/13/04	1
trans-1,4-Dichloro-2-butene	BDL	1.0	ug/l	8260B	09/13/04	1
Dichlorodifluoromethane	BDL	1.0	ug/l	8260B	09/13/04	1
1,1-Dichloroethane	BDL	1.0	ug/l	8260B	09/13/04	1
1,2-Dichloroethane	BDL	1.0	ug/l	8260B	09/13/04	1
1,1-Dichloroethene	BDL	1.0	ug/l	8260B	09/13/04	1
cis-1,2-Dichloroethene	BDL	1.0	ug/l	8260B	09/13/04	1
trans-1,2-Dichloroethene	BDL	1.0	ug/l	8260B	09/13/04	1
1,2-Dichloropropane	BDL	1.0	ug/l	8260B	09/13/04	1
1,3-Dichloropropane	BDL	1.0	ug/l	8260B	09/13/04	1
2,2-Dichloropropane	BDL	1.0	ug/l	8260B	09/13/04	1
1,1-Dichloropropene	BDL	1.0	ug/l	8260B	09/13/04	1
cis-1,3-Dichloropropene	BDL	1.0	ug/l	8260B	09/13/04	1
trans-1,3-Dichloropropene	BDL	1.0	ug/l	8260B	09/13/04	1
Di-isopropyl ether	BDL	1.0	ug/l	8260B	09/13/04	1
1,4-Dioxane	BDL	100	ug/l	8260B	09/13/04	1
Ethylbenzene	BDL	1.0	ug/l	8260B	09/13/04	1
Ethyl methacrylate	BDL	5.0	ug/l	8260B	09/13/04	1
Hexachlorobutadiene	BDL	1.0	ug/l	8260B	09/13/04	1
2-Hexanone	BDL	50.	ug/l	8260B	09/13/04	1
Iodomethane	BDL	50.	ug/l	8260B	09/13/04	1
Isopropylbenzene	BDL	1.0	ug/l	8260B	09/13/04	1
p-Isopropyltoluene	BDL	1.0	ug/l	8260B	09/13/04	1
Methacrylonitrile	BDL	50.	ug/l	8260B	09/13/04	1
Methylene Chloride	BDL	5.0	ug/l	8260B	09/13/04	1
Methyl methacrylate	BDL	50.	ug/l	8260B	09/13/04	1
4-Methyl-2-pentanone (MIBK)	BDL	50.	ug/l	8260B	09/13/04	1

BDL - Below Detection Limit

Det. Limit - Estimated Quantitation Limit (EQL)

Laboratory Certification Numbers:

AIHA - 100789, AL - 40660, CA - I-2327, CT- PH-0197, FL - E87487, GA - 923, IN - C-TN-01
KY - 90010, KYUST - 0016, NC - ENV375, DW21704, ND - R-140, SC - 84004, TN - 2006, VA - 00109, WV - 233



ENVIRONMENTAL
SCIENCE CORP.

12065 Lebanon Rd.
Mt. Juliet, TN 37122
(615) 758-5858
1-800-767-5859
Fax (615) 758-5859

Tax I.D. 62-0814289

Est. 1970

REPORT OF ANALYSIS

September 22, 2004

Mr. Mick Cossairt
Deffenbaugh Industries
18181 W. 53rd
Shawnee, KS 66203

Date Received : September 09, 2004
Description : ISC Oxbow Surface Water / Sediment
Sample ID : OX-4
Collected By :
Collection Date : 09/08/04 15:40

ESC Sample # : L168965-04

Site ID : OXBOW

Project # :

Parameter	Result	Det. Limit	Units	Method	Date	Dil.
Methyl tert-butyl ether	BDL	1.0	ug/l	8260B	09/13/04	1
Naphthalene	BDL	5.0	ug/l	8260B	09/13/04	1
Pentachloroethane	BDL	50.	ug/l	8260B	09/13/04	1
Propionitrile	BDL	50.	ug/l	8260B	09/13/04	1
n-Propylbenzene	BDL	1.0	ug/l	8260B	09/13/04	1
Styrene	BDL	1.0	ug/l	8260B	09/13/04	1
1,1,2,2-Tetrachloroethane	BDL	1.0	ug/l	8260B	09/13/04	1
1,1,1,2-Tetrachloroethane	BDL	1.0	ug/l	8260B	09/13/04	1
Tetrachloroethene	BDL	1.0	ug/l	8260B	09/13/04	1
Toluene	BDL	5.0	ug/l	8260B	09/13/04	1
1,2,3-Trichlorobenzene	BDL	1.0	ug/l	8260B	09/13/04	1
1,2,4-Trichlorobenzene	BDL	1.0	ug/l	8260B	09/13/04	1
1,1,1-Trichloroethane	BDL	1.0	ug/l	8260B	09/13/04	1
1,1,2-Trichloroethane	BDL	1.0	ug/l	8260B	09/13/04	1
Trichloroethene	BDL	1.0	ug/l	8260B	09/13/04	1
Trichlorofluoromethane	BDL	1.0	ug/l	8260B	09/13/04	1
1,2,3-Trichloropropane	BDL	1.0	ug/l	8260B	09/13/04	1
1,2,4-Trimethylbenzene	BDL	1.0	ug/l	8260B	09/13/04	1
1,3,5-Trimethylbenzene	BDL	1.0	ug/l	8260B	09/13/04	1
Vinyl chloride	BDL	1.0	ug/l	8260B	09/13/04	1
Xylenes, Total	BDL	3.0	ug/l	8260B	09/13/04	1
Surrogate Recovery						
Toluene-d8	100		% Rec.	8260B	09/13/04	1
Dibromofluoromethane	100		% Rec.	8260B	09/13/04	1
4-Bromofluorobenzene	100		% Rec.	8260B	09/13/04	1

Tom Mellette, ESC Representative

BDL - Below Detection Limit

Det. Limit - Estimated Quantitation Limit (EQL)

Laboratory Certification Numbers:

AIHA - 100789, AL - 40660, CA - I-2327, CT- PH-0197, FL - E87487, GA - 923, IN - C-TN-01
KY - 90010, KYUST - 0016, NC - ENV375, DW21704, ND - R-140, SC - 84004, TN - 2006, VA - 00109, WV - 233

Note:

The reported analytical results relate only to the sample submitted.
This report shall not be reproduced, except in full, without the written approval from ESC.

Reported: 09/20/04 16:50 Printed: 09/22/04 07:54



ENVIRONMENTAL SCIENCE CORP.

12065 Lebanon Rd.
Mt. Juliet, TN 37122
(615) 758-5858
1-800-767-5859
Fax (615) 758-5859

Tax I.D. 62-0814289

Est. 1970

REPORT OF ANALYSIS

Mr. Mick Cossairt
Deffenbaugh Industries
18181 W. 53rd
Shawnee, KS 66203

September 22, 2004

Date Received : September 09, 2004
Description : ISC Oxbow Surface Water / Sediment
Sample ID : OX-5
Collected By :
Collection Date : 09/08/04 14:40

ESC Sample # : L168965-05

Site ID : OXBOW

Project # :

Parameter	Result	Det. Limit	Units	Method	Date	Dil.
Mercury	BDL	0.20	ug/l	7470A	09/14/04	1
Arsenic	BDL	10.	ug/l	6010B	09/18/04	1
Arsenic, Dissolved	BDL	10.	ug/l	6010B	09/16/04	1
Barium	180	5.0	ug/l	6010B	09/18/04	1
Barium, Dissolved	110	5.0	ug/l	6010B	09/16/04	1
Cadmium	BDL	5.0	ug/l	6010B	09/18/04	1
Cadmium, Dissolved	BDL	5.0	ug/l	6010B	09/16/04	1
Chromium	BDL	10.	ug/l	6010B	09/18/04	1
Chromium, Dissolved	BDL	10.	ug/l	6010B	09/16/04	1
Lead	20.	5.0	ug/l	6010B	09/18/04	1
Lead, Dissolved	BDL	5.0	ug/l	6010B	09/17/04	1
Manganese	1000	10.	ug/l	6010B	09/18/04	1
Manganese, Dissolved	150	10.	ug/l	6010B	09/16/04	1
Nickel	BDL	10.	ug/l	6010B	09/18/04	1
Nickel, Dissolved	BDL	10.	ug/l	6010B	09/16/04	1
Selenium	12.	10.	ug/l	6010B	09/18/04	1
Selenium, Dissolved	16.	10.	ug/l	6010B	09/16/04	1
Silver	BDL	5.0	ug/l	6010B	09/18/04	1
Silver, Dissolved	BDL	5.0	ug/l	6010B	09/16/04	1
Volatile Organics						
Allyl chloride	BDL	50.	ug/l	8260B	09/13/04	1
1,4-Dioxane	BDL	100	ug/l	8260B	09/13/04	1
Ethyl methacrylate	BDL	5.0	ug/l	8260B	09/13/04	1
Methacrylonitrile	BDL	50.	ug/l	8260B	09/13/04	1
Methyl methacrylate	BDL	50.	ug/l	8260B	09/13/04	1
Pentachloroethane	BDL	50.	ug/l	8260B	09/13/04	1
Propionitrile	BDL	50.	ug/l	8260B	09/13/04	1
Surrogate Recovery						
Volatile Organics						
Acetone	BDL	50.	ug/l	8260B	09/14/04	1
Acrolein	BDL	50.	ug/l	8260B	09/14/04	1
Acrylonitrile	BDL	50.	ug/l	8260B	09/14/04	1
Benzene	BDL	1.0	ug/l	8260B	09/14/04	1
Bromobenzene	BDL	1.0	ug/l	8260B	09/14/04	1
Bromochloromethane	BDL	1.0	ug/l	8260B	09/14/04	1
Bromodichloromethane	BDL	1.0	ug/l	8260B	09/14/04	1

BDL - Below Detection Limit

Det. Limit - Estimated Quantitation Limit (EQL)

Laboratory Certification Numbers:

AIHA - 100789, AL - 40660, CA - I-2327, CT- PH-0197, FL - E87487, GA - 923, IN - C-TN-01
KY - 90010, KYUST - 0016, NC - ENV375, DW21704, ND - R-140, SC - 84004, TN - 2006, VA - 00109, WV - 233



ENVIRONMENTAL SCIENCE CORP.

12065 Lebanon Rd.
Mt. Juliet, TN 37122
(615) 758-5858
1-800-767-5859
Fax (615) 758-5859

Tax I.D. 62-0814289

Est. 1970

REPORT OF ANALYSIS

Mr. Mick Cossairt
Deffenbaugh Industries
18181 W. 53rd
Shawnee, KS 66203

September 22, 2004

Date Received : September 09, 2004
Description : ISC Oxbow Surface Water / Sediment
Sample ID : OX-5
Collected By :
Collection Date : 09/08/04 14:40

ESC Sample # : L168965-05

Site ID : OXBOW

Project # :

Parameter	Result	Det. Limit	Units	Method	Date	Dil.
Bromoform	BDL	1.0	ug/l	8260B	09/14/04	1
Bromomethane	BDL	1.0	ug/l	8260B	09/14/04	1
2-Butanone (MEK)	BDL	50.	ug/l	8260B	09/14/04	1
n-Butylbenzene	BDL	1.0	ug/l	8260B	09/14/04	1
sec-Butylbenzene	BDL	1.0	ug/l	8260B	09/14/04	1
tert-Butylbenzene	BDL	1.0	ug/l	8260B	09/14/04	1
Carbon disulfide	BDL	1.0	ug/l	8260B	09/14/04	1
Carbon tetrachloride	BDL	1.0	ug/l	8260B	09/14/04	1
Chlorobenzene	BDL	1.0	ug/l	8260B	09/14/04	1
Chlorodibromomethane	BDL	1.0	ug/l	8260B	09/14/04	1
Chloroethane	BDL	1.0	ug/l	8260B	09/14/04	1
2-Chloroethyl vinyl ether	BDL	10.	ug/l	8260B	09/14/04	1
Chloroform	BDL	5.0	ug/l	8260B	09/14/04	1
Chloromethane	BDL	1.0	ug/l	8260B	09/14/04	1
2-Chlorotoluene	BDL	1.0	ug/l	8260B	09/14/04	1
4-Chlorotoluene	BDL	1.0	ug/l	8260B	09/14/04	1
1,2-Dibromo-3-Chloropropane	BDL	1.0	ug/l	8260B	09/14/04	1
1,2-Dibromoethane	BDL	1.0	ug/l	8260B	09/14/04	1
Dibromomethane	BDL	1.0	ug/l	8260B	09/14/04	1
1,2-Dichlorobenzene	BDL	1.0	ug/l	8260B	09/14/04	1
1,3-Dichlorobenzene	BDL	1.0	ug/l	8260B	09/14/04	1
1,4-Dichlorobenzene	BDL	1.0	ug/l	8260B	09/14/04	1
trans-1,4-Dichloro-2-butene	BDL	1.0	ug/l	8260B	09/14/04	1
Dichlorodifluoromethane	BDL	1.0	ug/l	8260B	09/14/04	1
1,1-Dichloroethane	BDL	1.0	ug/l	8260B	09/14/04	1
1,2-Dichloroethane	BDL	1.0	ug/l	8260B	09/14/04	1
1,1-Dichloroethene	BDL	1.0	ug/l	8260B	09/14/04	1
cis-1,2-Dichloroethene	BDL	1.0	ug/l	8260B	09/14/04	1
trans-1,2-Dichloroethene	BDL	1.0	ug/l	8260B	09/14/04	1
1,2-Dichloropropane	BDL	1.0	ug/l	8260B	09/14/04	1
1,3-Dichloropropane	BDL	1.0	ug/l	8260B	09/14/04	1
2,2-Dichloropropane	BDL	1.0	ug/l	8260B	09/14/04	1
1,1-Dichloropropene	BDL	1.0	ug/l	8260B	09/14/04	1
cis-1,3-Dichloropropene	BDL	1.0	ug/l	8260B	09/14/04	1
trans-1,3-Dichloropropene	BDL	1.0	ug/l	8260B	09/14/04	1
Di-isopropyl ether	BDL	1.0	ug/l	8260B	09/14/04	1
Ethylbenzene	BDL	1.0	ug/l	8260B	09/14/04	1
Hexachlorobutadiene	BDL	1.0	ug/l	8260B	09/14/04	1
2-Hexanone	BDL	50.	ug/l	8260B	09/14/04	1

BDL - Below Detection Limit

Det. Limit - Estimated Quantitation Limit (EQL)

Laboratory Certification Numbers:

AIHA - 100789, AL - 40660, CA - I-2327, CT - PH-0197, FL - E87487, GA - 923, IN - C-TN-01
KY - 90010, KYUST - 0016, NC - ENV375, DW21704, ND - R-140, SC - 84004, TN - 2006, VA - 00109, WV - 233



ENVIRONMENTAL
SCIENCE CORP.

12065 Lebanon Rd.
Mt. Juliet, TN 37122
(615) 758-5858
1-800-767-5859
Fax (615) 758-5859

Tax I.D. 62-0814289

Est. 1970

REPORT OF ANALYSIS

Mr. Mick Cossairt
Deffenbaugh Industries
18181 W. 53rd
Shawnee, KS 66203

September 22, 2004

Date Received : September 09, 2004
Description : ISC Oxbow Surface Water / Sediment

ESC Sample # : L168965-05

Sample ID : OX-5

Site ID : OXBOW

Collected By :
Collection Date : 09/08/04 14:40

Project # :

Parameter	Result	Det. Limit	Units	Method	Date	Dil.
Iodomethane	BDL	50.	ug/l	8260B	09/14/04	1
Isopropylbenzene	BDL	1.0	ug/l	8260B	09/14/04	1
p-Isopropyltoluene	BDL	1.0	ug/l	8260B	09/14/04	1
Methylene Chloride	BDL	5.0	ug/l	8260B	09/14/04	1
4-Methyl-2-pentanone (MIBK)	BDL	50.	ug/l	8260B	09/14/04	1
Methyl tert-butyl ether	BDL	1.0	ug/l	8260B	09/14/04	1
Naphthalene	BDL	5.0	ug/l	8260B	09/14/04	1
n-Propylbenzene	BDL	1.0	ug/l	8260B	09/14/04	1
Styrene	BDL	1.0	ug/l	8260B	09/14/04	1
1,1,2,2-Tetrachloroethane	BDL	1.0	ug/l	8260B	09/14/04	1
1,1,1,2-Tetrachloroethane	BDL	1.0	ug/l	8260B	09/14/04	1
Tetrachloroethene	BDL	1.0	ug/l	8260B	09/14/04	1
Toluene	BDL	5.0	ug/l	8260B	09/14/04	1
1,2,3-Trichlorobenzene	BDL	1.0	ug/l	8260B	09/14/04	1
1,2,4-Trichlorobenzene	BDL	1.0	ug/l	8260B	09/14/04	1
1,1,1-Trichloroethane	BDL	1.0	ug/l	8260B	09/14/04	1
1,1,2-Trichloroethane	BDL	1.0	ug/l	8260B	09/14/04	1
Trichloroethene	BDL	1.0	ug/l	8260B	09/14/04	1
Trichlorofluoromethane	BDL	1.0	ug/l	8260B	09/14/04	1
1,2,3-Trichloropropane	BDL	1.0	ug/l	8260B	09/14/04	1
1,2,4-Trimethylbenzene	BDL	1.0	ug/l	8260B	09/14/04	1
1,3,5-Trimethylbenzene	BDL	1.0	ug/l	8260B	09/14/04	1
Vinyl chloride	BDL	1.0	ug/l	8260B	09/14/04	1
Xylenes, Total	BDL	3.0	ug/l	8260B	09/14/04	1
Surrogate Recovery						
Toluene-d8	100		% Rec.	8260B	09/14/04	1
Dibromofluoromethane	100		% Rec.	8260B	09/14/04	1
4-Bromofluorobenzene	100		% Rec.	8260B	09/14/04	1

Tom Mellette, ESC Representative

BDL - Below Detection Limit

Det. Limit - Estimated Quantitation Limit (EQL)

Laboratory Certification Numbers:

AIHA - 100789, AL - 40660, CA - I-2327, CT - PH-0197, FL - E87487, GA - 923, IN - C-TN-01
KY - 90010, KYUST - 0016, NC - ENV375, DW21704, ND - R-140, SC - 84004, TN - 2006, VA - 00109, WV - 233

Note:

The reported analytical results relate only to the sample submitted.

This report shall not be reproduced, except in full, without the written approval from ESC.

Reported: 09/20/04 16:50 Printed: 09/22/04 07:54



ENVIRONMENTAL SCIENCE CORP.

12065 Lebanon Rd.
Mt. Juliet, TN 37122
(615) 758-5858
1-800-767-5859
Fax (615) 758-5859

Tax I.D. 62-0814289

Est. 1970

REPORT OF ANALYSIS

Mr. Mick Cossairt
Deffenbaugh Industries
18181 W. 53rd
Shawnee, KS 66203

September 22, 2004

Date Received : September 09, 2004
Description : ISC Oxbow Surface Water / Sediment

ESC Sample # : L168965-06

Sample ID : OX-6

Site ID : OXBOW

Collected By :
Collection Date : 09/08/04 12:30

Project # :

Parameter	Result	Det. Limit	Units	Method	Date	Dil.
Mercury	BDL	0.20	ug/l	7470A	09/14/04	1
Arsenic	BDL	10.	ug/l	6010B	09/18/04	1
Arsenic, Dissolved	BDL	10.	ug/l	6010B	09/16/04	1
Barium	130	5.0	ug/l	6010B	09/18/04	1
Barium, Dissolved	94.	5.0	ug/l	6010B	09/16/04	1
Cadmium	BDL	5.0	ug/l	6010B	09/18/04	1
Cadmium, Dissolved	BDL	5.0	ug/l	6010B	09/16/04	1
Chromium	BDL	10.	ug/l	6010B	09/18/04	1
Chromium, Dissolved	BDL	10.	ug/l	6010B	09/16/04	1
Lead	5.3	5.0	ug/l	6010B	09/18/04	1
Lead, Dissolved	BDL	5.0	ug/l	6010B	09/17/04	1
Manganese	1500	10.	ug/l	6010B	09/18/04	1
Manganese, Dissolved	87.	10.	ug/l	6010B	09/16/04	1
Nickel	BDL	10.	ug/l	6010B	09/18/04	1
Nickel, Dissolved	BDL	10.	ug/l	6010B	09/16/04	1
Selenium	BDL	10.	ug/l	6010B	09/18/04	1
Selenium, Dissolved	BDL	10.	ug/l	6010B	09/16/04	1
Silver	BDL	5.0	ug/l	6010B	09/18/04	1
Silver, Dissolved	BDL	5.0	ug/l	6010B	09/16/04	1
Volatile Organics						
Allyl chloride	BDL	50.	ug/l	8260B	09/13/04	1
1,4-Dioxane	BDL	100	ug/l	8260B	09/13/04	1
Ethyl methacrylate	BDL	5.0	ug/l	8260B	09/13/04	1
Methacrylonitrile	BDL	50.	ug/l	8260B	09/13/04	1
Methyl methacrylate	BDL	50.	ug/l	8260B	09/13/04	1
Pentachloroethane	BDL	50.	ug/l	8260B	09/13/04	1
Propionitrile	BDL	50.	ug/l	8260B	09/13/04	1
Surrogate Recovery						
Volatile Organics						
Acetone	BDL	50.	ug/l	8260B	09/14/04	1
Acrolein	BDL	50.	ug/l	8260B	09/14/04	1
Acrylonitrile	BDL	50.	ug/l	8260B	09/14/04	1
Benzene	BDL	1.0	ug/l	8260B	09/14/04	1
Bromobenzene	BDL	1.0	ug/l	8260B	09/14/04	1
Bromochloromethane	BDL	1.0	ug/l	8260B	09/14/04	1
Bromodichloromethane	BDL	1.0	ug/l	8260B	09/14/04	1

BDL - Below Detection Limit

Det. Limit - Estimated Quantitation Limit (EQL)

Laboratory Certification Numbers:

AIHA - 100789, AL - 40660, CA - I-2327, CT - PH-0197, FL - E87487, GA - 923, IN - C-TN-01
KY - 90010, KYUST - 0016, NC - ENV375, DW21704, ND - R-140, SC - 84004, TN - 2006, VA - 00109, WV - 233



ENVIRONMENTAL SCIENCE CORP.

12065 Lebanon Rd.
Mt. Juliet, TN 37122
(615) 758-5858
1-800-767-5859
Fax (615) 758-5859

Tax I.D. 62-0814289

Est. 1970

REPORT OF ANALYSIS

Mr. Mick Cossairt
Deffenbaugh Industries
18181 W. 53rd
Shawnee, KS 66203

September 22, 2004

Date Received : September 09, 2004
Description : ISC Oxbow Surface Water / Sediment

ESC Sample # : L168965-06

Sample ID : OX-6

Site ID : OXBOW

Collected By :
Collection Date : 09/08/04 12:30

Project # :

Parameter	Result	Det. Limit	Units	Method	Date	Dil.
Bromoform	BDL	1.0	ug/l	8260B	09/14/04	1
Bromomethane	BDL	1.0	ug/l	8260B	09/14/04	1
2-Butanone (MEK)	BDL	50.	ug/l	8260B	09/14/04	1
n-Butylbenzene	BDL	1.0	ug/l	8260B	09/14/04	1
sec-Butylbenzene	BDL	1.0	ug/l	8260B	09/14/04	1
tert-Butylbenzene	BDL	1.0	ug/l	8260B	09/14/04	1
Carbon disulfide	BDL	1.0	ug/l	8260B	09/14/04	1
Carbon tetrachloride	BDL	1.0	ug/l	8260B	09/14/04	1
Chlorobenzene	BDL	1.0	ug/l	8260B	09/14/04	1
Chlorodibromomethane	BDL	1.0	ug/l	8260B	09/14/04	1
Chloroethane	BDL	1.0	ug/l	8260B	09/14/04	1
2-Chloroethyl vinyl ether	BDL	10.	ug/l	8260B	09/14/04	1
Chloroform	BDL	5.0	ug/l	8260B	09/14/04	1
Chloromethane	BDL	1.0	ug/l	8260B	09/14/04	1
2-Chlorotoluene	BDL	1.0	ug/l	8260B	09/14/04	1
4-Chlorotoluene	BDL	1.0	ug/l	8260B	09/14/04	1
1,2-Dibromo-3-Chloropropane	BDL	1.0	ug/l	8260B	09/14/04	1
1,2-Dibromoethane	BDL	1.0	ug/l	8260B	09/14/04	1
Dibromomethane	BDL	1.0	ug/l	8260B	09/14/04	1
1,2-Dichlorobenzene	BDL	1.0	ug/l	8260B	09/14/04	1
1,3-Dichlorobenzene	BDL	1.0	ug/l	8260B	09/14/04	1
1,4-Dichlorobenzene	BDL	1.0	ug/l	8260B	09/14/04	1
trans-1,4-Dichloro-2-butene	BDL	1.0	ug/l	8260B	09/14/04	1
Dichlorodifluoromethane	BDL	1.0	ug/l	8260B	09/14/04	1
1,1-Dichloroethane	BDL	1.0	ug/l	8260B	09/14/04	1
1,2-Dichloroethane	BDL	1.0	ug/l	8260B	09/14/04	1
1,1-Dichloroethene	BDL	1.0	ug/l	8260B	09/14/04	1
cis-1,2-Dichloroethene	BDL	1.0	ug/l	8260B	09/14/04	1
trans-1,2-Dichloroethene	BDL	1.0	ug/l	8260B	09/14/04	1
1,2-Dichloropropane	BDL	1.0	ug/l	8260B	09/14/04	1
1,3-Dichloropropane	BDL	1.0	ug/l	8260B	09/14/04	1
2,2-Dichloropropane	BDL	1.0	ug/l	8260B	09/14/04	1
1,1-Dichloropropene	BDL	1.0	ug/l	8260B	09/14/04	1
cis-1,3-Dichloropropene	BDL	1.0	ug/l	8260B	09/14/04	1
trans-1,3-Dichloropropene	BDL	1.0	ug/l	8260B	09/14/04	1
Di-isopropyl ether	BDL	1.0	ug/l	8260B	09/14/04	1
Ethylbenzene	BDL	1.0	ug/l	8260B	09/14/04	1
Hexachlorobutadiene	BDL	1.0	ug/l	8260B	09/14/04	1
2-Hexanone	BDL	50.	ug/l	8260B	09/14/04	1

BDL - Below Detection Limit

Det. Limit - Estimated Quantitation Limit(EQL)

Laboratory Certification Numbers:

AIHA - 100789, AL - 40660, CA - I-2327, CT- PH-0197, FL - E87487, GA - 923, IN - C-TN-01
KY - 90010, KYUST - 0016, NC - ENV375, DW21704, ND - R-140, SC - 84004, TN - 2006, VA - 00109, WV - 233



ENVIRONMENTAL
SCIENCE CORP.

12065 Lebanon Rd.
Mt. Juliet, TN 37122
(615) 758-5858
1-800-767-5859
Fax (615) 758-5859

Tax I.D. 62-0814289

Est. 1970

REPORT OF ANALYSIS

Mr. Mick Cossairt
Deffenbaugh Industries
18181 W. 53rd
Shawnee, KS 66203

September 22, 2004

Date Received : September 09, 2004
Description : ISC Oxbow Surface Water / Sediment
Sample ID : OX-6
Collected By :
Collection Date : 09/08/04 12:30

ESC Sample # : L168965-06

Site ID : OXBOW

Project # :

Parameter	Result	Det. Limit	Units	Method	Date	Dil.
Iodomethane	BDL	50.	ug/l	8260B	09/14/04	1
Isopropylbenzene	BDL	1.0	ug/l	8260B	09/14/04	1
p-Isopropyltoluene	BDL	1.0	ug/l	8260B	09/14/04	1
Methylene Chloride	BDL	5.0	ug/l	8260B	09/14/04	1
4-Methyl-2-pentanone (MIBK)	BDL	50.	ug/l	8260B	09/14/04	1
Methyl tert-butyl ether	BDL	1.0	ug/l	8260B	09/14/04	1
Naphthalene	BDL	5.0	ug/l	8260B	09/14/04	1
n-Propylbenzene	BDL	1.0	ug/l	8260B	09/14/04	1
Styrene	BDL	1.0	ug/l	8260B	09/14/04	1
1,1,2,2-Tetrachloroethane	BDL	1.0	ug/l	8260B	09/14/04	1
1,1,1,2-Tetrachloroethane	BDL	1.0	ug/l	8260B	09/14/04	1
Tetrachloroethene	BDL	1.0	ug/l	8260B	09/14/04	1
Toluene	BDL	5.0	ug/l	8260B	09/14/04	1
1,2,3-Trichlorobenzene	BDL	1.0	ug/l	8260B	09/14/04	1
1,2,4-Trichlorobenzene	BDL	1.0	ug/l	8260B	09/14/04	1
1,1,1-Trichloroethane	BDL	1.0	ug/l	8260B	09/14/04	1
1,1,2-Trichloroethane	BDL	1.0	ug/l	8260B	09/14/04	1
Trichloroethene	BDL	1.0	ug/l	8260B	09/14/04	1
Trichlorofluoromethane	BDL	1.0	ug/l	8260B	09/14/04	1
1,2,3-Trichloropropane	BDL	1.0	ug/l	8260B	09/14/04	1
1,2,4-Trimethylbenzene	BDL	1.0	ug/l	8260B	09/14/04	1
1,3,5-Trimethylbenzene	BDL	1.0	ug/l	8260B	09/14/04	1
Vinyl chloride	BDL	1.0	ug/l	8260B	09/14/04	1
Xylenes, Total	BDL	3.0	ug/l	8260B	09/14/04	1
Surrogate Recovery						
Toluene-d8	99.		% Rec.	8260B	09/14/04	1
Dibromofluoromethane	100		% Rec.	8260B	09/14/04	1
4-Bromofluorobenzene	99.		% Rec.	8260B	09/14/04	1

Tom Mellette, ESC Representative

BDL - Below Detection Limit

Det. Limit - Estimated Quantitation Limit (EQL)

Laboratory Certification Numbers:

AIHA - 100789, AL - 40660, CA - I-2327, CT - PH-0197, FL - E87487, GA - 923, IN - C-TN-01
KY - 90010, KYUST - 0016, NC - ENV375, DW21704, ND - R-140, SC - 84004, TN - 2006, VA - 00109, WV - 233

Note:

The reported analytical results relate only to the sample submitted.

This report shall not be reproduced, except in full, without the written approval from ESC.

Reported: 09/20/04 16:50 Printed: 09/22/04 07:55



ENVIRONMENTAL SCIENCE CORP.

12065 Lebanon Rd.
Mt. Juliet, TN 37122
(615) 758-5858
1-800-767-5859
Fax (615) 758-5859

Tax I.D. 62-0814289

Est. 1970

REPORT OF ANALYSIS

Mr. Mick Cossairt
Deffenbaugh Industries
18181 W. 53rd
Shawnee, KS 66203

September 22, 2004

Date Received : September 09, 2004
Description : ISC Oxbow Surface Water / Sediment
Sample ID : OX-7
Collected By :
Collection Date : 09/08/04 16:30

ESC Sample # : L168965-07

Site ID : OXBOW

Project # :

Parameter	Result	Det. Limit	Units	Method	Date	Dil.
Mercury	BDL	0.20	ug/l	7470A	09/14/04	1
Arsenic	BDL	10.	ug/l	6010B	09/18/04	1
Arsenic, Dissolved	BDL	10.	ug/l	6010B	09/16/04	1
Barium	120	5.0	ug/l	6010B	09/18/04	1
Barium, Dissolved	100	5.0	ug/l	6010B	09/16/04	1
Cadmium	BDL	5.0	ug/l	6010B	09/18/04	1
Cadmium, Dissolved	BDL	5.0	ug/l	6010B	09/16/04	1
Chromium	BDL	10.	ug/l	6010B	09/18/04	1
Chromium, Dissolved	BDL	10.	ug/l	6010B	09/16/04	1
Lead	BDL	5.0	ug/l	6010B	09/18/04	1
Lead, Dissolved	BDL	5.0	ug/l	6010B	09/17/04	1
Manganese	420	10.	ug/l	6010B	09/18/04	1
Manganese, Dissolved	BDL	10.	ug/l	6010B	09/16/04	1
Nickel	BDL	10.	ug/l	6010B	09/18/04	1
Nickel, Dissolved	BDL	10.	ug/l	6010B	09/16/04	1
Selenium	BDL	10.	ug/l	6010B	09/18/04	1
Selenium, Dissolved	BDL	10.	ug/l	6010B	09/16/04	1
Silver	BDL	5.0	ug/l	6010B	09/18/04	1
Silver, Dissolved	BDL	5.0	ug/l	6010B	09/16/04	1
Volatile Organics						
Allyl chloride	BDL	50.	ug/l	8260B	09/13/04	1
1,4-Dioxane	BDL	100	ug/l	8260B	09/13/04	1
Ethyl methacrylate	BDL	5.0	ug/l	8260B	09/13/04	1
Methacrylonitrile	BDL	50.	ug/l	8260B	09/13/04	1
Methyl methacrylate	BDL	50.	ug/l	8260B	09/13/04	1
Pentachloroethane	BDL	50.	ug/l	8260B	09/13/04	1
Propionitrile	BDL	50.	ug/l	8260B	09/13/04	1
Surrogate Recovery						
Volatile Organics						
Acetone	BDL	50.	ug/l	8260B	09/14/04	1
Acrolein	BDL	50.	ug/l	8260B	09/14/04	1
Acrylonitrile	BDL	50.	ug/l	8260B	09/14/04	1
Benzene	BDL	1.0	ug/l	8260B	09/14/04	1
Bromobenzene	BDL	1.0	ug/l	8260B	09/14/04	1
Bromochloromethane	BDL	1.0	ug/l	8260B	09/14/04	1
Bromodichloromethane	BDL	1.0	ug/l	8260B	09/14/04	1

BDL - Below Detection Limit

Det. Limit - Estimated Quantitation Limit (EQL)

Laboratory Certification Numbers:

AIHA - 100789, AL - 40660, CA - I-2327, CT - PH-0197, FL - E87487, GA - 923, IN - C-TN-01
KY - 90010, KYUST - 0016, NC - ENV375, DW21704, ND - R-140, SC - 84004, TN - 2006, VA - 00109, WV - 233



ENVIRONMENTAL SCIENCE CORP.

12065 Lebanon Rd.
Mt. Juliet, TN 37122
(615) 758-5858
1-800-767-5859
Fax (615) 758-5859

Tax I.D. 62-0814289

Est. 1970

REPORT OF ANALYSIS

Mr. Mick Cossairt
Deffenbaugh Industries
18181 W. 53rd
Shawnee, KS 66203

September 22, 2004

Date Received : September 09, 2004
Description : ISC Oxbow Surface Water / Sediment
Sample ID : OX-7
Collected By :
Collection Date : 09/08/04 16:30

ESC Sample # : L168965-07

Site ID : OXBOW

Project # :

Parameter	Result	Det. Limit	Units	Method	Date	Dil.
Bromoform	BDL	1.0	ug/l	8260B	09/14/04	1
Bromomethane	BDL	1.0	ug/l	8260B	09/14/04	1
2-Butanone (MEK)	BDL	50.	ug/l	8260B	09/14/04	1
n-Butylbenzene	BDL	1.0	ug/l	8260B	09/14/04	1
sec-Butylbenzene	BDL	1.0	ug/l	8260B	09/14/04	1
tert-Butylbenzene	BDL	1.0	ug/l	8260B	09/14/04	1
Carbon disulfide	BDL	1.0	ug/l	8260B	09/14/04	1
Carbon tetrachloride	BDL	1.0	ug/l	8260B	09/14/04	1
Chlorobenzene	BDL	1.0	ug/l	8260B	09/14/04	1
Chlorodibromomethane	BDL	1.0	ug/l	8260B	09/14/04	1
Chloroethane	BDL	1.0	ug/l	8260B	09/14/04	1
2-Chloroethyl vinyl ether	BDL	10.	ug/l	8260B	09/14/04	1
Chloroform	BDL	5.0	ug/l	8260B	09/14/04	1
Chloromethane	BDL	1.0	ug/l	8260B	09/14/04	1
2-Chlorotoluene	BDL	1.0	ug/l	8260B	09/14/04	1
4-Chlorotoluene	BDL	1.0	ug/l	8260B	09/14/04	1
1,2-Dibromo-3-Chloropropane	BDL	1.0	ug/l	8260B	09/14/04	1
1,2-Dibromoethane	BDL	1.0	ug/l	8260B	09/14/04	1
Dibromomethane	BDL	1.0	ug/l	8260B	09/14/04	1
1,2-Dichlorobenzene	BDL	1.0	ug/l	8260B	09/14/04	1
1,3-Dichlorobenzene	BDL	1.0	ug/l	8260B	09/14/04	1
1,4-Dichlorobenzene	BDL	1.0	ug/l	8260B	09/14/04	1
trans-1,4-Dichloro-2-butene	BDL	1.0	ug/l	8260B	09/14/04	1
Dichlorodifluoromethane	BDL	1.0	ug/l	8260B	09/14/04	1
1,1-Dichloroethane	BDL	1.0	ug/l	8260B	09/14/04	1
1,2-Dichloroethane	BDL	1.0	ug/l	8260B	09/14/04	1
1,1-Dichloroethene	BDL	1.0	ug/l	8260B	09/14/04	1
cis-1,2-Dichloroethene	BDL	1.0	ug/l	8260B	09/14/04	1
trans-1,2-Dichloroethene	BDL	1.0	ug/l	8260B	09/14/04	1
1,2-Dichloropropane	BDL	1.0	ug/l	8260B	09/14/04	1
1,3-Dichloropropane	BDL	1.0	ug/l	8260B	09/14/04	1
2,2-Dichloropropane	BDL	1.0	ug/l	8260B	09/14/04	1
1,1-Dichloropropene	BDL	1.0	ug/l	8260B	09/14/04	1
cis-1,3-Dichloropropene	BDL	1.0	ug/l	8260B	09/14/04	1
trans-1,3-Dichloropropene	BDL	1.0	ug/l	8260B	09/14/04	1
Di-isopropyl ether	BDL	1.0	ug/l	8260B	09/14/04	1
Ethylbenzene	BDL	1.0	ug/l	8260B	09/14/04	1
Hexachlorobutadiene	BDL	1.0	ug/l	8260B	09/14/04	1
2-Hexanone	BDL	50.	ug/l	8260B	09/14/04	1

BDL - Below Detection Limit

Det. Limit - Estimated Quantitation Limit (EQL)

Laboratory Certification Numbers:

AIHA - 100789, AL - 40660, CA - I-2327, CT - PH-0197, FL - E87487, GA - 923, IN - C-TN-01
KY - 90010, KYUST - 0016, NC - ENV375, DW21704, ND - R-140, SC - 84004, TN - 2006, VA - 00109, WV - 233



ENVIRONMENTAL
SCIENCE CORP.

12065 Lebanon Rd.
Mt. Juliet, TN 37122
(615) 758-5858
1-800-767-5859
Fax (615) 758-5859

Tax I.D. 62-0814289

Est. 1970

REPORT OF ANALYSIS

Mr. Mick Cossairt
Deffenbaugh Industries
18181 W. 53rd
Shawnee, KS 66203

September 22, 2004

Date Received : September 09, 2004
Description : ISC Oxbow Surface Water / Sediment

ESC Sample # : L168965-07

Sample ID : OX-7

Site ID : OXBOW

Collected By :
Collection Date : 09/08/04 16:30

Project # :

Parameter	Result	Det. Limit	Units	Method	Date	Dil.
Iodomethane	BDL	50.	ug/l	8260B	09/14/04	1
Isopropylbenzene	BDL	1.0	ug/l	8260B	09/14/04	1
p-Isopropyltoluene	BDL	1.0	ug/l	8260B	09/14/04	1
Methylene Chloride	BDL	5.0	ug/l	8260B	09/14/04	1
4-Methyl-2-pentanone (MIBK)	BDL	50.	ug/l	8260B	09/14/04	1
Methyl tert-butyl ether	BDL	1.0	ug/l	8260B	09/14/04	1
Naphthalene	BDL	5.0	ug/l	8260B	09/14/04	1
n-Propylbenzene	BDL	1.0	ug/l	8260B	09/14/04	1
Styrene	BDL	1.0	ug/l	8260B	09/14/04	1
1,1,2,2-Tetrachloroethane	BDL	1.0	ug/l	8260B	09/14/04	1
1,1,1,2-Tetrachloroethane	BDL	1.0	ug/l	8260B	09/14/04	1
Tetrachloroethene	BDL	1.0	ug/l	8260B	09/14/04	1
Toluene	BDL	5.0	ug/l	8260B	09/14/04	1
1,2,3-Trichlorobenzene	BDL	1.0	ug/l	8260B	09/14/04	1
1,2,4-Trichlorobenzene	BDL	1.0	ug/l	8260B	09/14/04	1
1,1,1-Trichloroethane	BDL	1.0	ug/l	8260B	09/14/04	1
1,1,2-Trichloroethane	BDL	1.0	ug/l	8260B	09/14/04	1
Trichloroethene	BDL	1.0	ug/l	8260B	09/14/04	1
Trichlorofluoromethane	BDL	1.0	ug/l	8260B	09/14/04	1
1,2,3-Trichloropropane	BDL	1.0	ug/l	8260B	09/14/04	1
1,2,4-Trimethylbenzene	BDL	1.0	ug/l	8260B	09/14/04	1
1,3,5-Trimethylbenzene	BDL	1.0	ug/l	8260B	09/14/04	1
Vinyl chloride	BDL	1.0	ug/l	8260B	09/14/04	1
Xylenes, Total	BDL	3.0	ug/l	8260B	09/14/04	1
Surrogate Recovery						
Toluene-d8	99.		% Rec.	8260B	09/14/04	1
Dibromofluoromethane	100		% Rec.	8260B	09/14/04	1
4-Bromofluorobenzene	98.		% Rec.	8260B	09/14/04	1

Tom Mellette, ESC Representative

BDL - Below Detection Limit

Det. Limit - Estimated Quantitation Limit (EQL)

Laboratory Certification Numbers:

AIHA - 100789, AL - 40660, CA - I-2327, CT- PH-0197, FL - E87487, GA - 923, IN - C-TN-01
KY - 90010, KYUST - 0016, NC - ENV375, DW21704, ND - R-140, SC - 84004, TN - 2006, VA - 00109, WV - 233

Note:

The reported analytical results relate only to the sample submitted.

This report shall not be reproduced, except in full, without the written approval from ESC.

Reported: 09/20/04 16:50 Printed: 09/22/04 07:55



ENVIRONMENTAL SCIENCE CORP.

12065 Lebanon Rd.
Mt. Juliet, TN 37122
(615) 758-5858
1-800-767-5859
Fax (615) 758-5859

Tax I.D. 62-0814289

Est. 1970

REPORT OF ANALYSIS

Mr. Mick Cossairt
Deffenbaugh Industries
18181 W. 53rd
Shawnee, KS 66203

September 22, 2004

Date Received : September 09, 2004
Description : ISC Oxbow Surface Water / Sediment

ESC Sample # : L168965-08

Sample ID : OX-8

Site ID : OXBOW

Collected By :
Collection Date : 09/08/04 16:45

Project # :

Parameter	Result	Det. Limit	Units	Method	Date	Dil.
Mercury	BDL	0.20	ug/l	7470A	09/14/04	1
Arsenic	BDL	10.	ug/l	6010B	09/18/04	1
Arsenic, Dissolved	BDL	10.	ug/l	6010B	09/16/04	1
Barium	110	5.0	ug/l	6010B	09/18/04	1
Barium, Dissolved	110	5.0	ug/l	6010B	09/16/04	1
Cadmium	BDL	5.0	ug/l	6010B	09/18/04	1
Cadmium, Dissolved	BDL	5.0	ug/l	6010B	09/16/04	1
Chromium	BDL	10.	ug/l	6010B	09/18/04	1
Chromium, Dissolved	BDL	10.	ug/l	6010B	09/16/04	1
Lead	BDL	5.0	ug/l	6010B	09/18/04	1
Lead, Dissolved	BDL	5.0	ug/l	6010B	09/17/04	1
Manganese	360	10.	ug/l	6010B	09/18/04	1
Manganese, Dissolved	BDL	10.	ug/l	6010B	09/16/04	1
Nickel	BDL	10.	ug/l	6010B	09/18/04	1
Nickel, Dissolved	BDL	10.	ug/l	6010B	09/16/04	1
Selenium	BDL	10.	ug/l	6010B	09/18/04	1
Selenium, Dissolved	BDL	10.	ug/l	6010B	09/16/04	1
Silver	BDL	5.0	ug/l	6010B	09/18/04	1
Silver, Dissolved	BDL	5.0	ug/l	6010B	09/16/04	1
Volatile Organics						
Allyl chloride	BDL	50.	ug/l	8260B	09/13/04	1
1,4-Dioxane	BDL	100	ug/l	8260B	09/13/04	1
Ethyl methacrylate	BDL	5.0	ug/l	8260B	09/13/04	1
Methacrylonitrile	BDL	50.	ug/l	8260B	09/13/04	1
Methyl methacrylate	BDL	50.	ug/l	8260B	09/13/04	1
Pentachloroethane	BDL	50.	ug/l	8260B	09/13/04	1
Propionitrile	BDL	50.	ug/l	8260B	09/13/04	1
Surrogate Recovery						
Volatile Organics						
Acetone	BDL	50.	ug/l	8260B	09/14/04	1
Acrolein	BDL	50.	ug/l	8260B	09/14/04	1
Acrylonitrile	BDL	50.	ug/l	8260B	09/14/04	1
Benzene	BDL	1.0	ug/l	8260B	09/14/04	1
Bromobenzene	BDL	1.0	ug/l	8260B	09/14/04	1
Bromochloromethane	BDL	1.0	ug/l	8260B	09/14/04	1
Bromodichloromethane	BDL	1.0	ug/l	8260B	09/14/04	1

BDL - Below Detection Limit

Det. Limit - Estimated Quantitation Limit (EQL)

Laboratory Certification Numbers:

AIHA - 100789, AL - 40660, CA - I-2327, CT - PH-0197, FL - E87487, GA - 923, IN - C-TN-01
KY - 90010, KYUST - 0016, NC - ENV375, DW21704, ND - R-140, SC - 84004, TN - 2006, VA - 00109, WV - 233



ENVIRONMENTAL SCIENCE CORP.

12065 Lebanon Rd.
Mt. Juliet, TN 37122
(615) 758-5858
1-800-767-5859
Fax (615) 758-5859

Tax I.D. 62-0814289

Est. 1970

REPORT OF ANALYSIS

Mr. Mick Cossairt
Deffenbaugh Industries
18181 W. 53rd
Shawnee, KS 66203

September 22, 2004

Date Received : September 09, 2004
Description : ISC Oxbow Surface Water / Sediment
Sample ID : OX-8
Collected By :
Collection Date : 09/08/04 16:45

ESC Sample # : L168965-08

Site ID : OXBOW

Project # :

Parameter	Result	Det. Limit	Units	Method	Date	Dil.
Bromoform	BDL	1.0	ug/l	8260B	09/14/04	1
Bromomethane	BDL	1.0	ug/l	8260B	09/14/04	1
2-Butanone (MEK)	BDL	50.	ug/l	8260B	09/14/04	1
n-Butylbenzene	BDL	1.0	ug/l	8260B	09/14/04	1
sec-Butylbenzene	BDL	1.0	ug/l	8260B	09/14/04	1
tert-Butylbenzene	BDL	1.0	ug/l	8260B	09/14/04	1
Carbon disulfide	BDL	1.0	ug/l	8260B	09/14/04	1
Carbon tetrachloride	BDL	1.0	ug/l	8260B	09/14/04	1
Chlorobenzene	BDL	1.0	ug/l	8260B	09/14/04	1
Chlorodibromomethane	BDL	1.0	ug/l	8260B	09/14/04	1
Chloroethane	BDL	1.0	ug/l	8260B	09/14/04	1
2-Chloroethyl vinyl ether	BDL	10.	ug/l	8260B	09/14/04	1
Chloroform	BDL	5.0	ug/l	8260B	09/14/04	1
Chloromethane	BDL	1.0	ug/l	8260B	09/14/04	1
2-Chlorotoluene	BDL	1.0	ug/l	8260B	09/14/04	1
4-Chlorotoluene	BDL	1.0	ug/l	8260B	09/14/04	1
1,2-Dibromo-3-Chloropropane	BDL	1.0	ug/l	8260B	09/14/04	1
1,2-Dibromoethane	BDL	1.0	ug/l	8260B	09/14/04	1
Dibromomethane	BDL	1.0	ug/l	8260B	09/14/04	1
1,2-Dichlorobenzene	BDL	1.0	ug/l	8260B	09/14/04	1
1,3-Dichlorobenzene	BDL	1.0	ug/l	8260B	09/14/04	1
1,4-Dichlorobenzene	BDL	1.0	ug/l	8260B	09/14/04	1
trans-1,4-Dichloro-2-butene	BDL	1.0	ug/l	8260B	09/14/04	1
Dichlorodifluoromethane	BDL	1.0	ug/l	8260B	09/14/04	1
1,1-Dichloroethane	BDL	1.0	ug/l	8260B	09/14/04	1
1,2-Dichloroethane	BDL	1.0	ug/l	8260B	09/14/04	1
1,1-Dichloroethene	BDL	1.0	ug/l	8260B	09/14/04	1
cis-1,2-Dichloroethene	BDL	1.0	ug/l	8260B	09/14/04	1
trans-1,2-Dichloroethene	BDL	1.0	ug/l	8260B	09/14/04	1
1,2-Dichloropropane	BDL	1.0	ug/l	8260B	09/14/04	1
1,3-Dichloropropane	BDL	1.0	ug/l	8260B	09/14/04	1
2,2-Dichloropropane	BDL	1.0	ug/l	8260B	09/14/04	1
1,1-Dichloropropene	BDL	1.0	ug/l	8260B	09/14/04	1
cis-1,3-Dichloropropene	BDL	1.0	ug/l	8260B	09/14/04	1
trans-1,3-Dichloropropene	BDL	1.0	ug/l	8260B	09/14/04	1
Di-isopropyl ether	BDL	1.0	ug/l	8260B	09/14/04	1
Ethylbenzene	BDL	1.0	ug/l	8260B	09/14/04	1
Hexachlorobutadiene	BDL	1.0	ug/l	8260B	09/14/04	1
2-Hexanone	BDL	50.	ug/l	8260B	09/14/04	1

BDL - Below Detection Limit

Det. Limit - Estimated Quantitation Limit (EQL)

Laboratory Certification Numbers:

AIHA - 100789, AL - 40660, CA - I-2327, CT- PH-0197, FL - E87487, GA - 923, IN - C-TN-01
KY - 90010, KYUST - 0016, NC - ENV375, DW21704, ND - R-140, SC - 84004, TN - 2006, VA - 00109, WV - 233



ENVIRONMENTAL
SCIENCE CORP.

12065 Lebanon Rd.
Mt. Juliet, TN 37122
(615) 758-5858
1-800-767-5859
Fax (615) 758-5859

Tax I.D. 62-0814289

Est. 1970

REPORT OF ANALYSIS

Mr. Mick Cossairt
Deffenbaugh Industries
18181 W. 53rd
Shawnee, KS 66203

September 22, 2004

Date Received : September 09, 2004
Description : ISC Oxbow Surface Water / Sediment
Sample ID : OX-8
Collected By :
Collection Date : 09/08/04 16:45

ESC Sample # : L168965-08

Site ID : OXBOW

Project # :

Parameter	Result	Det. Limit	Units	Method	Date	Dil.
Iodomethane	BDL	50.	ug/l	8260B	09/14/04	1
Isopropylbenzene	BDL	1.0	ug/l	8260B	09/14/04	1
p-Isopropyltoluene	BDL	1.0	ug/l	8260B	09/14/04	1
Methylene Chloride	BDL	5.0	ug/l	8260B	09/14/04	1
4-Methyl-2-pentanone (MIBK)	BDL	50.	ug/l	8260B	09/14/04	1
Methyl tert-butyl ether	BDL	1.0	ug/l	8260B	09/14/04	1
Naphthalene	BDL	5.0	ug/l	8260B	09/14/04	1
n-Propylbenzene	BDL	1.0	ug/l	8260B	09/14/04	1
Styrene	BDL	1.0	ug/l	8260B	09/14/04	1
1,1,2,2-Tetrachloroethane	BDL	1.0	ug/l	8260B	09/14/04	1
1,1,1,2-Tetrachloroethane	BDL	1.0	ug/l	8260B	09/14/04	1
Tetrachloroethene	BDL	1.0	ug/l	8260B	09/14/04	1
Toluene	BDL	5.0	ug/l	8260B	09/14/04	1
1,2,3-Trichlorobenzene	BDL	1.0	ug/l	8260B	09/14/04	1
1,2,4-Trichlorobenzene	BDL	1.0	ug/l	8260B	09/14/04	1
1,1,1-Trichloroethane	BDL	1.0	ug/l	8260B	09/14/04	1
1,1,2-Trichloroethane	BDL	1.0	ug/l	8260B	09/14/04	1
Trichloroethene	BDL	1.0	ug/l	8260B	09/14/04	1
Trichlorofluoromethane	BDL	1.0	ug/l	8260B	09/14/04	1
1,2,3-Trichloropropane	BDL	1.0	ug/l	8260B	09/14/04	1
1,2,4-Trimethylbenzene	BDL	1.0	ug/l	8260B	09/14/04	1
1,3,5-Trimethylbenzene	BDL	1.0	ug/l	8260B	09/14/04	1
Vinyl chloride	BDL	1.0	ug/l	8260B	09/14/04	1
Xylenes, Total	BDL	3.0	ug/l	8260B	09/14/04	1
Surrogate Recovery						
Toluene-d8	99.		% Rec.	8260B	09/14/04	1
Dibromofluoromethane	100		% Rec.	8260B	09/14/04	1
4-Bromofluorobenzene	99.		% Rec.	8260B	09/14/04	1

Tom Mellette, ESC Representative

BDL - Below Detection Limit

Det. Limit - Estimated Quantitation Limit (EQL)

Laboratory Certification Numbers:

AIHA - 100789, AL - 40660, CA - I-2327, CT- PH-0197, FL - E87487, GA - 923, IN - C-TN-01
KY - 90010, KYUST - 0016, NC - ENV375, DW21704, ND - R-140, SC - 84004, TN - 2006, VA - 00109, WV - 233

Note:

The reported analytical results relate only to the sample submitted.

This report shall not be reproduced, except in full, without the written approval from ESC.

Reported: 09/20/04 16:50 Printed: 09/22/04 07:55



ENVIRONMENTAL SCIENCE CORP.

12065 Lebanon Rd.
Mt. Juliet, TN 37122
(615) 758-5858
1-800-767-5859
Fax (615) 758-5859

Tax I.D. 62-0814289

Est. 1970

REPORT OF ANALYSIS

Mr. Mick Cossairt
Deffenbaugh Industries
18181 W. 53rd
Shawnee, KS 66203

September 22, 2004

Date Received : September 09, 2004
Description : ISC Oxbow Surface Water / Sediment
Sample ID : OX-9
Collected By :
Collection Date : 09/08/04 15:55

ESC Sample # : L168965-09

Site ID : OXBOW

Project # :

Parameter	Result	Det. Limit	Units	Method	Date	Dil.
Mercury	BDL	0.20	ug/l	7470A	09/14/04	1
Arsenic	BDL	10.	ug/l	6010B	09/18/04	1
Arsenic, Dissolved	BDL	10.	ug/l	6010B	09/16/04	1
Barium	120	5.0	ug/l	6010B	09/18/04	1
Barium, Dissolved	100	5.0	ug/l	6010B	09/16/04	1
Cadmium	BDL	5.0	ug/l	6010B	09/18/04	1
Cadmium, Dissolved	BDL	5.0	ug/l	6010B	09/16/04	1
Chromium	BDL	10.	ug/l	6010B	09/18/04	1
Chromium, Dissolved	BDL	10.	ug/l	6010B	09/16/04	1
Lead	BDL	5.0	ug/l	6010B	09/18/04	1
Lead, Dissolved	BDL	5.0	ug/l	6010B	09/17/04	1
Manganese	630	10.	ug/l	6010B	09/18/04	1
Manganese, Dissolved	BDL	10.	ug/l	6010B	09/16/04	1
Nickel	BDL	10.	ug/l	6010B	09/18/04	1
Nickel, Dissolved	BDL	10.	ug/l	6010B	09/16/04	1
Selenium	10.	10.	ug/l	6010B	09/18/04	1
Selenium, Dissolved	BDL	10.	ug/l	6010B	09/16/04	1
Silver	BDL	5.0	ug/l	6010B	09/18/04	1
Silver, Dissolved	BDL	5.0	ug/l	6010B	09/16/04	1
Volatiles Organics						
Allyl chloride	BDL	50.	ug/l	8260B	09/13/04	1
1,4-Dioxane	BDL	100	ug/l	8260B	09/13/04	1
Ethyl methacrylate	BDL	5.0	ug/l	8260B	09/13/04	1
Methacrylonitrile	BDL	50.	ug/l	8260B	09/13/04	1
Methyl methacrylate	BDL	50.	ug/l	8260B	09/13/04	1
Pentachloroethane	BDL	50.	ug/l	8260B	09/13/04	1
Propionitrile	BDL	50.	ug/l	8260B	09/13/04	1
Surrogate Recovery						
Volatiles Organics						
Acetone	BDL	50.	ug/l	8260B	09/14/04	1
Acrolein	BDL	50.	ug/l	8260B	09/14/04	1
Acrylonitrile	BDL	50.	ug/l	8260B	09/14/04	1
Benzene	BDL	1.0	ug/l	8260B	09/14/04	1
Bromobenzene	BDL	1.0	ug/l	8260B	09/14/04	1
Bromochloromethane	BDL	1.0	ug/l	8260B	09/14/04	1
Bromodichloromethane	BDL	1.0	ug/l	8260B	09/14/04	1

BDL - Below Detection Limit

Det. Limit - Estimated Quantitation Limit (EQL)

Laboratory Certification Numbers:

AIHA - 100789, AL - 40660, CA - I-2327, CT- PH-0197, FL - E87487, GA - 923, IN - C-TN-01
KY - 90010, KYUST - 0016, NC - ENV375, DW21704, ND - R-140, SC - 84004, TN - 2006, VA - 00109, WV - 233



ENVIRONMENTAL SCIENCE CORP.

12065 Lebanon Rd.
Mt. Juliet, TN 37122
(615) 758-5858
1-800-767-5859
Fax (615) 758-5859

Tax I.D. 62-0814289

Est. 1970

REPORT OF ANALYSIS

Mr. Mick Cossairt
Deffenbaugh Industries
18181 W. 53rd
Shawnee, KS 66203

September 22, 2004

Date Received : September 09, 2004
Description : ISC Oxbow Surface Water / Sediment
Sample ID : OX-9
Collected By :
Collection Date : 09/08/04 15:55

ESC Sample # : L168965-09

Site ID : OXBOW

Project # :

Parameter	Result	Det. Limit	Units	Method	Date	Dil.
Bromoform	BDL	1.0	ug/l	8260B	09/14/04	1
Bromomethane	BDL	1.0	ug/l	8260B	09/14/04	1
2-Butanone (MEK)	BDL	50.	ug/l	8260B	09/14/04	1
n-Butylbenzene	BDL	1.0	ug/l	8260B	09/14/04	1
sec-Butylbenzene	BDL	1.0	ug/l	8260B	09/14/04	1
tert-Butylbenzene	BDL	1.0	ug/l	8260B	09/14/04	1
Carbon disulfide	BDL	1.0	ug/l	8260B	09/14/04	1
Carbon tetrachloride	BDL	1.0	ug/l	8260B	09/14/04	1
Chlorobenzene	BDL	1.0	ug/l	8260B	09/14/04	1
Chlorodibromomethane	BDL	1.0	ug/l	8260B	09/14/04	1
Chloroethane	BDL	1.0	ug/l	8260B	09/14/04	1
2-Chloroethyl vinyl ether	BDL	10.	ug/l	8260B	09/14/04	1
Chloroform	BDL	5.0	ug/l	8260B	09/14/04	1
Chloromethane	BDL	1.0	ug/l	8260B	09/14/04	1
2-Chlorotoluene	BDL	1.0	ug/l	8260B	09/14/04	1
4-Chlorotoluene	BDL	1.0	ug/l	8260B	09/14/04	1
1,2-Dibromo-3-Chloropropane	BDL	1.0	ug/l	8260B	09/14/04	1
1,2-Dibromoethane	BDL	1.0	ug/l	8260B	09/14/04	1
Dibromomethane	BDL	1.0	ug/l	8260B	09/14/04	1
1,2-Dichlorobenzene	BDL	1.0	ug/l	8260B	09/14/04	1
1,3-Dichlorobenzene	BDL	1.0	ug/l	8260B	09/14/04	1
1,4-Dichlorobenzene	BDL	1.0	ug/l	8260B	09/14/04	1
trans-1,4-Dichloro-2-butene	BDL	1.0	ug/l	8260B	09/14/04	1
Dichlorodifluoromethane	BDL	1.0	ug/l	8260B	09/14/04	1
1,1-Dichloroethane	BDL	1.0	ug/l	8260B	09/14/04	1
1,2-Dichloroethane	BDL	1.0	ug/l	8260B	09/14/04	1
1,1-Dichloroethene	BDL	1.0	ug/l	8260B	09/14/04	1
cis-1,2-Dichloroethene	BDL	1.0	ug/l	8260B	09/14/04	1
trans-1,2-Dichloroethene	BDL	1.0	ug/l	8260B	09/14/04	1
1,2-Dichloropropane	BDL	1.0	ug/l	8260B	09/14/04	1
1,3-Dichloropropane	BDL	1.0	ug/l	8260B	09/14/04	1
2,2-Dichloropropane	BDL	1.0	ug/l	8260B	09/14/04	1
1,1-Dichloropropene	BDL	1.0	ug/l	8260B	09/14/04	1
cis-1,3-Dichloropropene	BDL	1.0	ug/l	8260B	09/14/04	1
trans-1,3-Dichloropropene	BDL	1.0	ug/l	8260B	09/14/04	1
Di-isopropyl ether	BDL	1.0	ug/l	8260B	09/14/04	1
Ethylbenzene	BDL	1.0	ug/l	8260B	09/14/04	1
Hexachlorobutadiene	BDL	1.0	ug/l	8260B	09/14/04	1
2-Hexanone	BDL	50.	ug/l	8260B	09/14/04	1

BDL - Below Detection Limit

Det. Limit - Estimated Quantitation Limit(EQL)

Laboratory Certification Numbers:

AIHA - 100789, AL - 40660, CA - I-2327, CT- PH-0197, FL - E87487, GA - 923, IN - C-TN-01
KY - 90010, KYUST - 0016, NC - ENV375, DW21704, ND - R-140, SC - 84004, TN - 2006, VA - 00109, WV - 233



ENVIRONMENTAL
SCIENCE CORP.

12065 Lebanon Rd.
Mt. Juliet, TN 37122
(615) 758-5858
1-800-767-5859
Fax (615) 758-5859

Tax I.D. 62-0814289

Est. 1970

REPORT OF ANALYSIS

Mr. Mick Cossairt
Deffenbaugh Industries
18181 W. 53rd
Shawnee, KS 66203

September 22, 2004

Date Received : September 09, 2004
Description : ISC Oxbow Surface Water / Sediment
Sample ID : OX-9
Collected By :
Collection Date : 09/08/04 15:55

ESC Sample # : L168965-09

Site ID : OXBOW

Project # :

Parameter	Result	Det. Limit	Units	Method	Date	Dil.
Iodomethane	BDL	50.	ug/l	8260B	09/14/04	1
Isopropylbenzene	BDL	1.0	ug/l	8260B	09/14/04	1
p-Isopropyltoluene	BDL	1.0	ug/l	8260B	09/14/04	1
Methylene Chloride	BDL	5.0	ug/l	8260B	09/14/04	1
4-Methyl-2-pentanone (MIBK)	BDL	50.	ug/l	8260B	09/14/04	1
Methyl tert-butyl ether	BDL	1.0	ug/l	8260B	09/14/04	1
Naphthalene	BDL	5.0	ug/l	8260B	09/14/04	1
n-Propylbenzene	BDL	1.0	ug/l	8260B	09/14/04	1
Styrene	BDL	1.0	ug/l	8260B	09/14/04	1
1,1,2,2-Tetrachloroethane	BDL	1.0	ug/l	8260B	09/14/04	1
1,1,1,2-Tetrachloroethane	BDL	1.0	ug/l	8260B	09/14/04	1
Tetrachloroethene	BDL	1.0	ug/l	8260B	09/14/04	1
Toluene	BDL	5.0	ug/l	8260B	09/14/04	1
1,2,3-Trichlorobenzene	BDL	1.0	ug/l	8260B	09/14/04	1
1,2,4-Trichlorobenzene	BDL	1.0	ug/l	8260B	09/14/04	1
1,1,1-Trichloroethane	BDL	1.0	ug/l	8260B	09/14/04	1
1,1,2-Trichloroethane	BDL	1.0	ug/l	8260B	09/14/04	1
Trichloroethene	BDL	1.0	ug/l	8260B	09/14/04	1
Trichlorofluoromethane	BDL	1.0	ug/l	8260B	09/14/04	1
1,2,3-Trichloropropane	BDL	1.0	ug/l	8260B	09/14/04	1
1,2,4-Trimethylbenzene	BDL	1.0	ug/l	8260B	09/14/04	1
1,3,5-Trimethylbenzene	BDL	1.0	ug/l	8260B	09/14/04	1
Vinyl chloride	BDL	1.0	ug/l	8260B	09/14/04	1
Xylenes, Total	BDL	3.0	ug/l	8260B	09/14/04	1
Surrogate Recovery						
Toluene-d8	99.		% Rec.	8260B	09/14/04	1
Dibromofluoromethane	100		% Rec.	8260B	09/14/04	1
4-Bromofluorobenzene	98.		% Rec.	8260B	09/14/04	1

Tom Mallette, ESC Representative

BDL - Below Detection Limit

Det. Limit - Estimated Quantitation Limit (EQL)

Laboratory Certification Numbers:

AIHA - 100789, AL - 40660, CA - I-2327, CT- PH-0197, FL - E87487, GA - 923, IN - C-TN-01
KY - 90010, KYUST - 0016, NC - ENV375, DW21704, ND - R-140, SC - 84004, TN - 2006, VA - 00109, WV - 233

Note:

The reported analytical results relate only to the sample submitted.

This report shall not be reproduced, except in full, without the written approval from ESC.

Reported: 09/20/04 16:50 Printed: 09/22/04 07:55



ENVIRONMENTAL SCIENCE CORP.

12065 Lebanon Rd.
Mt. Juliet, TN 37122
(615) 758-5858
1-800-767-5859
Fax (615) 758-5859

Tax I.D. 62-0814289

Est. 1970

REPORT OF ANALYSIS

Mr. Mick Cossairt
Deffenbaugh Industries
18181 W. 53rd
Shawnee, KS 66203

September 22, 2004

Date Received : September 09, 2004
Description : ISC Oxbow Surface Water / Sediment

ESC Sample # : L168965-10

Sample ID : OX-10

Site ID : OXBOW

Collected By :
Collection Date : 09/08/04 14:55

Project # :

Parameter	Result	Det. Limit	Units	Method	Date	Dil.
Mercury	BDL	0.20	ug/l	7470A	09/14/04	1
Arsenic	BDL	10.	ug/l	6010B	09/18/04	1
Arsenic, Dissolved	BDL	10.	ug/l	6010B	09/16/04	1
Barium	230	5.0	ug/l	6010B	09/18/04	1
Barium, Dissolved	110	5.0	ug/l	6010B	09/16/04	1
Cadmium	BDL	5.0	ug/l	6010B	09/18/04	1
Cadmium, Dissolved	BDL	5.0	ug/l	6010B	09/16/04	1
Chromium	12.	10.	ug/l	6010B	09/18/04	1
Chromium, Dissolved	BDL	10.	ug/l	6010B	09/16/04	1
Lead	39.	5.0	ug/l	6010B	09/18/04	1
Lead, Dissolved	BDL	5.0	ug/l	6010B	09/17/04	1
Manganese	1800	10.	ug/l	6010B	09/18/04	1
Manganese, Dissolved	280	10.	ug/l	6010B	09/16/04	1
Nickel	BDL	10.	ug/l	6010B	09/18/04	1
Nickel, Dissolved	BDL	10.	ug/l	6010B	09/16/04	1
Selenium	BDL	10.	ug/l	6010B	09/18/04	1
Selenium, Dissolved	BDL	10.	ug/l	6010B	09/16/04	1
Silver	BDL	5.0	ug/l	6010B	09/18/04	1
Silver, Dissolved	BDL	5.0	ug/l	6010B	09/16/04	1
Volatile Organics						
Allyl chloride	BDL	50.	ug/l	8260B	09/13/04	1
1,4-Dioxane	BDL	100	ug/l	8260B	09/13/04	1
Ethyl methacrylate	BDL	5.0	ug/l	8260B	09/13/04	1
Methacrylonitrile	BDL	50.	ug/l	8260B	09/13/04	1
Methyl methacrylate	BDL	50.	ug/l	8260B	09/13/04	1
Pentachloroethane	BDL	50.	ug/l	8260B	09/13/04	1
Propionitrile	BDL	50.	ug/l	8260B	09/13/04	1
Surrogate Recovery						
Volatile Organics						
Acetone	BDL	50.	ug/l	8260B	09/14/04	1
Acrolein	BDL	50.	ug/l	8260B	09/14/04	1
Acrylonitrile	BDL	50.	ug/l	8260B	09/14/04	1
Benzene	BDL	1.0	ug/l	8260B	09/14/04	1
Bromobenzene	BDL	1.0	ug/l	8260B	09/14/04	1
Bromochloromethane	BDL	1.0	ug/l	8260B	09/14/04	1
Bromodichloromethane	BDL	1.0	ug/l	8260B	09/14/04	1

BDL - Below Detection Limit

Det. Limit - Estimated Quantitation Limit (EQL)

Laboratory Certification Numbers:

AIHA - 100789, AL - 40660, CA - I-2327, CT- PH-0197, FL - E87487, GA - 923, IN - C-TN-01
KY - 90010, KYUST - 0016, NC - ENV375, DW21704, ND - R-140, SC - 84004, TN - 2006, VA - 00109, WV - 233



ENVIRONMENTAL
SCIENCE CORP.

12065 Lebanon Rd.
Mt. Juliet, TN 37122
(615) 758-5858
1-800-767-5859
Fax (615) 758-5859

Tax I.D. 62-0814289

Est. 1970

REPORT OF ANALYSIS

Mr. Mick Cossairt
Deffenbaugh Industries
18181 W. 53rd
Shawnee, KS 66203

September 22, 2004

Date Received : September 09, 2004
Description : ISC Oxbow Surface Water / Sediment
Sample ID : OX-10
Collected By :
Collection Date : 09/08/04 14:55

ESC Sample # : L168965-10

Site ID : OXBOW

Project # :

Parameter	Result	Det. Limit	Units	Method	Date	Dil.
Bromoform	BDL	1.0	ug/l	8260B	09/14/04	1
Bromomethane	BDL	1.0	ug/l	8260B	09/14/04	1
2-Butanone (MEK)	BDL	50.	ug/l	8260B	09/14/04	1
n-Butylbenzene	BDL	1.0	ug/l	8260B	09/14/04	1
sec-Butylbenzene	BDL	1.0	ug/l	8260B	09/14/04	1
tert-Butylbenzene	BDL	1.0	ug/l	8260B	09/14/04	1
Carbon disulfide	BDL	1.0	ug/l	8260B	09/14/04	1
Carbon tetrachloride	BDL	1.0	ug/l	8260B	09/14/04	1
Chlorobenzene	BDL	1.0	ug/l	8260B	09/14/04	1
Chlorodibromomethane	BDL	1.0	ug/l	8260B	09/14/04	1
Chloroethane	BDL	1.0	ug/l	8260B	09/14/04	1
2-Chloroethyl vinyl ether	BDL	10.	ug/l	8260B	09/14/04	1
Chloroform	BDL	5.0	ug/l	8260B	09/14/04	1
Chloromethane	BDL	1.0	ug/l	8260B	09/14/04	1
2-Chlorotoluene	BDL	1.0	ug/l	8260B	09/14/04	1
4-Chlorotoluene	BDL	1.0	ug/l	8260B	09/14/04	1
1,2-Dibromo-3-Chloropropane	BDL	1.0	ug/l	8260B	09/14/04	1
1,2-Dibromoethane	BDL	1.0	ug/l	8260B	09/14/04	1
Dibromomethane	BDL	1.0	ug/l	8260B	09/14/04	1
1,2-Dichlorobenzene	BDL	1.0	ug/l	8260B	09/14/04	1
1,3-Dichlorobenzene	BDL	1.0	ug/l	8260B	09/14/04	1
1,4-Dichlorobenzene	BDL	1.0	ug/l	8260B	09/14/04	1
trans-1,4-Dichloro-2-butene	BDL	1.0	ug/l	8260B	09/14/04	1
Dichlorodifluoromethane	BDL	1.0	ug/l	8260B	09/14/04	1
1,1-Dichloroethane	BDL	1.0	ug/l	8260B	09/14/04	1
1,2-Dichloroethane	BDL	1.0	ug/l	8260B	09/14/04	1
1,1-Dichloroethene	BDL	1.0	ug/l	8260B	09/14/04	1
cis-1,2-Dichloroethene	BDL	1.0	ug/l	8260B	09/14/04	1
trans-1,2-Dichloroethene	BDL	1.0	ug/l	8260B	09/14/04	1
1,2-Dichloropropane	BDL	1.0	ug/l	8260B	09/14/04	1
1,3-Dichloropropane	BDL	1.0	ug/l	8260B	09/14/04	1
2,2-Dichloropropane	BDL	1.0	ug/l	8260B	09/14/04	1
1,1-Dichloropropene	BDL	1.0	ug/l	8260B	09/14/04	1
cis-1,3-Dichloropropene	BDL	1.0	ug/l	8260B	09/14/04	1
trans-1,3-Dichloropropene	BDL	1.0	ug/l	8260B	09/14/04	1
Di-isopropyl ether	BDL	1.0	ug/l	8260B	09/14/04	1
Ethylbenzene	BDL	1.0	ug/l	8260B	09/14/04	1
Hexachlorobutadiene	BDL	1.0	ug/l	8260B	09/14/04	1
2-Hexanone	BDL	50.	ug/l	8260B	09/14/04	1

BDL - Below Detection Limit

Det. Limit - Estimated Quantitation Limit(EQL)

Laboratory Certification Numbers:

AIHA - 100789, AL - 40660, CA - I-2327, CT- PH-0197, FL - E87487, GA - 923, IN - C-TN-01
KY - 90010, KYUST - 0016, NC - ENV375, DW21704, ND - R-140, SC - 84004, TN - 2006, VA - 00109, WV - 233



ENVIRONMENTAL
SCIENCE CORP.

12065 Lebanon Rd.
Mt. Juliet, TN 37122
(615) 758-5858
1-800-767-5859
Fax (615) 758-5859

Tax I.D. 62-0814289

Est. 1970

REPORT OF ANALYSIS

Mr. Mick Cossairt
Deffenbaugh Industries
18181 W. 53rd
Shawnee, KS 66203

September 22, 2004

Date Received : September 09, 2004
Description : ISC Oxbow Surface Water / Sediment

ESC Sample # : L168965-10

Sample ID : OX-10

Site ID : OXBOW

Collected By :
Collection Date : 09/08/04 14:55

Project # :

Parameter	Result	Det. Limit	Units	Method	Date	Dil.
Iodomethane	BDL	50.	ug/l	8260B	09/14/04	1
Isopropylbenzene	BDL	1.0	ug/l	8260B	09/14/04	1
p-Isopropyltoluene	BDL	1.0	ug/l	8260B	09/14/04	1
Methylene Chloride	BDL	5.0	ug/l	8260B	09/14/04	1
4-Methyl-2-pentanone (MIBK)	BDL	50.	ug/l	8260B	09/14/04	1
Methyl tert-butyl ether	BDL	1.0	ug/l	8260B	09/14/04	1
Naphthalene	BDL	5.0	ug/l	8260B	09/14/04	1
n-Propylbenzene	BDL	1.0	ug/l	8260B	09/14/04	1
Styrene	BDL	1.0	ug/l	8260B	09/14/04	1
1,1,2,2-Tetrachloroethane	BDL	1.0	ug/l	8260B	09/14/04	1
1,1,1,2-Tetrachloroethane	BDL	1.0	ug/l	8260B	09/14/04	1
Tetrachloroethene	BDL	1.0	ug/l	8260B	09/14/04	1
Toluene	BDL	5.0	ug/l	8260B	09/14/04	1
1,2,3-Trichlorobenzene	BDL	1.0	ug/l	8260B	09/14/04	1
1,2,4-Trichlorobenzene	BDL	1.0	ug/l	8260B	09/14/04	1
1,1,1-Trichloroethane	BDL	1.0	ug/l	8260B	09/14/04	1
1,1,2-Trichloroethane	BDL	1.0	ug/l	8260B	09/14/04	1
Trichloroethene	BDL	1.0	ug/l	8260B	09/14/04	1
Trichlorofluoromethane	BDL	1.0	ug/l	8260B	09/14/04	1
1,2,3-Trichloropropane	BDL	1.0	ug/l	8260B	09/14/04	1
1,2,4-Trimethylbenzene	BDL	1.0	ug/l	8260B	09/14/04	1
1,3,5-Trimethylbenzene	BDL	1.0	ug/l	8260B	09/14/04	1
Vinyl chloride	BDL	1.0	ug/l	8260B	09/14/04	1
Xylenes, Total	BDL	3.0	ug/l	8260B	09/14/04	1
Surrogate Recovery						
Toluene-d8	100		% Rec.	8260B	09/14/04	1
Dibromofluoromethane	100		% Rec.	8260B	09/14/04	1
4-Bromofluorobenzene	99.		% Rec.	8260B	09/14/04	1

Tom Mellette, ESC Representative

BDL - Below Detection Limit

Det. Limit - Estimated Quantitation Limit (EQL)

Laboratory Certification Numbers:

AIHA - 100789, AL - 40660, CA - I-2327, CT- PH-0197, FL - E87487, GA - 923, IN - C-TN-01
KY - 90010, KYUST - 0016, NC - ENV375, DW21704, ND - R-140, SC - 84004, TN - 2006, VA - 00109, WV - 233

Note:

The reported analytical results relate only to the sample submitted.

This report shall not be reproduced, except in full, without the written approval from ESC.

Reported: 09/20/04 16:50 Printed: 09/22/04 07:55



ENVIRONMENTAL SCIENCE CORP.

12065 Lebanon Rd.
Mt. Juliet, TN 37122
(615) 758-5858
1-800-767-5859
Fax (615) 758-5859

Tax I.D. 62-0814289

Est. 1970

REPORT OF ANALYSIS

Mr. Mick Cossairt
Deffenbaugh Industries
18181 W. 53rd
Shawnee, KS 66203

September 22, 2004

Date Received : September 09, 2004
Description : ISC Oxbow Surface Water / Sediment
Sample ID : BRU-1
Collected By :
Collection Date : 09/08/04 17:45

ESC Sample # : L168965-11

Site ID : OXBOW

Project # :

Parameter	Result	Det. Limit	Units	Method	Date	Dil.
Mercury	BDL	0.20	ug/l	7470A	09/14/04	1
Arsenic	BDL	10.	ug/l	6010B	09/18/04	1
Arsenic, Dissolved	BDL	10.	ug/l	6010B	09/16/04	1
Barium	120	5.0	ug/l	6010B	09/18/04	1
Barium, Dissolved	100	5.0	ug/l	6010B	09/16/04	1
Cadmium	BDL	5.0	ug/l	6010B	09/18/04	1
Cadmium, Dissolved	BDL	5.0	ug/l	6010B	09/16/04	1
Chromium	BDL	10.	ug/l	6010B	09/18/04	1
Chromium, Dissolved	BDL	10.	ug/l	6010B	09/16/04	1
Lead	BDL	5.0	ug/l	6010B	09/18/04	1
Lead, Dissolved	BDL	5.0	ug/l	6010B	09/17/04	1
Manganese	130	10.	ug/l	6010B	09/18/04	1
Manganese, Dissolved	BDL	10.	ug/l	6010B	09/16/04	1
Nickel	BDL	10.	ug/l	6010B	09/18/04	1
Nickel, Dissolved	BDL	10.	ug/l	6010B	09/16/04	1
Selenium	BDL	10.	ug/l	6010B	09/18/04	1
Selenium, Dissolved	BDL	10.	ug/l	6010B	09/16/04	1
Silver	BDL	5.0	ug/l	6010B	09/18/04	1
Silver, Dissolved	BDL	5.0	ug/l	6010B	09/16/04	1
Volatile Organics						
Allyl chloride	BDL	50.	ug/l	8260B	09/13/04	1
1,4-Dioxane	BDL	100	ug/l	8260B	09/13/04	1
Ethyl methacrylate	BDL	5.0	ug/l	8260B	09/13/04	1
Methacrylonitrile	BDL	50.	ug/l	8260B	09/13/04	1
Methyl methacrylate	BDL	50.	ug/l	8260B	09/13/04	1
Pentachloroethane	BDL	50.	ug/l	8260B	09/13/04	1
Propionitrile	BDL	50.	ug/l	8260B	09/13/04	1
Surrogate Recovery						
Volatile Organics						
Acetone	BDL	50.	ug/l	8260B	09/14/04	1
Acrolein	BDL	50.	ug/l	8260B	09/14/04	1
Acrylonitrile	BDL	50.	ug/l	8260B	09/14/04	1
Benzene	BDL	1.0	ug/l	8260B	09/14/04	1
Bromobenzene	BDL	1.0	ug/l	8260B	09/14/04	1
Bromochloromethane	BDL	1.0	ug/l	8260B	09/14/04	1
Bromodichloromethane	BDL	1.0	ug/l	8260B	09/14/04	1

BDL - Below Detection Limit

Det. Limit - Estimated Quantitation Limit (EQL)

Laboratory Certification Numbers:

AIHA - 100789, AL - 40660, CA - I-2327, CT- PH-0197, FL - E87487, GA - 923, IN - C-TN-01
KY - 90010, KYUST - 0016, NC - ENV375, DW21704, ND - R-140, SC - 84004, TN - 2006, VA - 00109, WV - 233



ENVIRONMENTAL SCIENCE CORP.

12065 Lebanon Rd.
Mt. Juliet, TN 37122
(615) 758-5858
1-800-767-5859
Fax (615) 758-5859

Tax I.D. 62-0814289

Est. 1970

REPORT OF ANALYSIS

Mr. Mick Cossairt
Deffenbaugh Industries
18181 W. 53rd
Shawnee, KS 66203

September 22, 2004

Date Received : September 09, 2004
Description : ISC Oxbow Surface Water / Sediment
Sample ID : BRU-1
Collected By :
Collection Date : 09/08/04 17:45

ESC Sample # : L168965-11

Site ID : OXBOW

Project # :

Parameter	Result	Det. Limit	Units	Method	Date	Dil.
Bromoform	BDL	1.0	ug/l	8260B	09/14/04	1
Bromomethane	BDL	1.0	ug/l	8260B	09/14/04	1
2-Butanone (MEK)	BDL	50.	ug/l	8260B	09/14/04	1
n-Butylbenzene	BDL	1.0	ug/l	8260B	09/14/04	1
sec-Butylbenzene	BDL	1.0	ug/l	8260B	09/14/04	1
tert-Butylbenzene	BDL	1.0	ug/l	8260B	09/14/04	1
Carbon disulfide	BDL	1.0	ug/l	8260B	09/14/04	1
Carbon tetrachloride	BDL	1.0	ug/l	8260B	09/14/04	1
Chlorobenzene	BDL	1.0	ug/l	8260B	09/14/04	1
Chlorodibromomethane	BDL	1.0	ug/l	8260B	09/14/04	1
Chloroethane	BDL	1.0	ug/l	8260B	09/14/04	1
2-Chloroethyl vinyl ether	BDL	10.	ug/l	8260B	09/14/04	1
Chloroform	BDL	5.0	ug/l	8260B	09/14/04	1
Chloromethane	BDL	1.0	ug/l	8260B	09/14/04	1
2-Chlorotoluene	BDL	1.0	ug/l	8260B	09/14/04	1
4-Chlorotoluene	BDL	1.0	ug/l	8260B	09/14/04	1
1,2-Dibromo-3-Chloropropane	BDL	1.0	ug/l	8260B	09/14/04	1
1,2-Dibromoethane	BDL	1.0	ug/l	8260B	09/14/04	1
Dibromomethane	BDL	1.0	ug/l	8260B	09/14/04	1
1,2-Dichlorobenzene	BDL	1.0	ug/l	8260B	09/14/04	1
1,3-Dichlorobenzene	BDL	1.0	ug/l	8260B	09/14/04	1
1,4-Dichlorobenzene	BDL	1.0	ug/l	8260B	09/14/04	1
trans-1,4-Dichloro-2-butene	BDL	1.0	ug/l	8260B	09/14/04	1
Dichlorodifluoromethane	BDL	1.0	ug/l	8260B	09/14/04	1
1,1-Dichloroethane	BDL	1.0	ug/l	8260B	09/14/04	1
1,2-Dichloroethane	BDL	1.0	ug/l	8260B	09/14/04	1
1,1-Dichloroethene	BDL	1.0	ug/l	8260B	09/14/04	1
cis-1,2-Dichloroethene	BDL	1.0	ug/l	8260B	09/14/04	1
trans-1,2-Dichloroethene	BDL	1.0	ug/l	8260B	09/14/04	1
1,2-Dichloropropane	BDL	1.0	ug/l	8260B	09/14/04	1
1,3-Dichloropropane	BDL	1.0	ug/l	8260B	09/14/04	1
2,2-Dichloropropane	BDL	1.0	ug/l	8260B	09/14/04	1
1,1-Dichloropropene	BDL	1.0	ug/l	8260B	09/14/04	1
cis-1,3-Dichloropropene	BDL	1.0	ug/l	8260B	09/14/04	1
trans-1,3-Dichloropropene	BDL	1.0	ug/l	8260B	09/14/04	1
Di-isopropyl ether	BDL	1.0	ug/l	8260B	09/14/04	1
Ethylbenzene	BDL	1.0	ug/l	8260B	09/14/04	1
Hexachlorobutadiene	BDL	1.0	ug/l	8260B	09/14/04	1
2-Hexanone	BDL	50.	ug/l	8260B	09/14/04	1

BDL - Below Detection Limit

Det. Limit - Estimated Quantitation Limit (EQL)

Laboratory Certification Numbers:

AIHA - 100789, AL - 40660, CA - I-2327, CT - PH-0197, FL - E87487, GA - 923, IN - C-TN-01
KY - 90010, KYUST - 0016, NC - ENV375, DW21704, ND - R-140, SC - 84004, TN - 2006, VA - 00109, WV - 233



ENVIRONMENTAL
SCIENCE CORP.

12065 Lebanon Rd.
Mt. Juliet, TN 37122
(615) 758-5858
1-800-767-5859
Fax (615) 758-5859

Tax I.D. 62-0814289

Est. 1970

REPORT OF ANALYSIS

Mr. Mick Cossairt
Deffenbaugh Industries
18181 W. 53rd
Shawnee, KS 66203

September 22, 2004

Date Received : September 09, 2004
Description : ISC Oxbow Surface Water / Sediment
Sample ID : BRU-1
Collected By :
Collection Date : 09/08/04 17:45

ESC Sample # : L168965-11

Site ID : OXBOW

Project # :

Parameter	Result	Det. Limit	Units	Method	Date	Dil.
Iodomethane	BDL	50.	ug/l	8260B	09/14/04	1
Isopropylbenzene	BDL	1.0	ug/l	8260B	09/14/04	1
p-Isopropyltoluene	BDL	1.0	ug/l	8260B	09/14/04	1
Methylene Chloride	BDL	5.0	ug/l	8260B	09/14/04	1
4-Methyl-2-pentanone (MIBK)	BDL	50.	ug/l	8260B	09/14/04	1
Methyl tert-butyl ether	BDL	1.0	ug/l	8260B	09/14/04	1
Naphthalene	BDL	5.0	ug/l	8260B	09/14/04	1
n-Propylbenzene	BDL	1.0	ug/l	8260B	09/14/04	1
Styrene	BDL	1.0	ug/l	8260B	09/14/04	1
1,1,2,2-Tetrachloroethane	BDL	1.0	ug/l	8260B	09/14/04	1
1,1,1,2-Tetrachloroethane	BDL	1.0	ug/l	8260B	09/14/04	1
Tetrachloroethene	BDL	1.0	ug/l	8260B	09/14/04	1
Toluene	BDL	5.0	ug/l	8260B	09/14/04	1
1,2,3-Trichlorobenzene	BDL	1.0	ug/l	8260B	09/14/04	1
1,2,4-Trichlorobenzene	BDL	1.0	ug/l	8260B	09/14/04	1
1,1,1-Trichloroethane	BDL	1.0	ug/l	8260B	09/14/04	1
1,1,2-Trichloroethane	BDL	1.0	ug/l	8260B	09/14/04	1
Trichloroethene	BDL	1.0	ug/l	8260B	09/14/04	1
Trichlorofluoromethane	BDL	1.0	ug/l	8260B	09/14/04	1
1,2,3-Trichloropropane	BDL	1.0	ug/l	8260B	09/14/04	1
1,2,4-Trimethylbenzene	BDL	1.0	ug/l	8260B	09/14/04	1
1,3,5-Trimethylbenzene	BDL	1.0	ug/l	8260B	09/14/04	1
Vinyl chloride	BDL	1.0	ug/l	8260B	09/14/04	1
Xylenes, Total	BDL	3.0	ug/l	8260B	09/14/04	1
Surrogate Recovery						
Toluene-d8	98.		% Rec.	8260B	09/14/04	1
Dibromofluoromethane	100		% Rec.	8260B	09/14/04	1
4-Bromofluorobenzene	100		% Rec.	8260B	09/14/04	1

Tom Mallette, ESC Representative

BDL - Below Detection Limit

Det. Limit - Estimated Quantitation Limit (EQL)

Laboratory Certification Numbers:

AIHA - 100789, AL - 40660, CA - I-2327, CT- PH-0197, FL - E87487, GA - 923, IN - C-TN-01
KY - 90010, KYUST - 0016, NC - ENV375, DW21704, ND - R-140, SC - 84004, TN - 2006, VA - 00109, WV - 233

Note:

The reported analytical results relate only to the sample submitted.

This report shall not be reproduced, except in full, without the written approval from ESC.

Reported: 09/20/04 16:50 Printed: 09/22/04 07:55



ENVIRONMENTAL SCIENCE CORP.

12065 Lebanon Rd.
Mt. Juliet, TN 37122
(615) 758-5858
1-800-767-5859
Fax (615) 758-5859

Tax I.D. 62-0814289

Est. 1970

REPORT OF ANALYSIS

Mr. Mick Cossairt
Deffenbaugh Industries
18181 W. 53rd
Shawnee, KS 66203

September 22, 2004

Date Received : September 09, 2004
Description : ISC Oxbow Surface Water / Sediment
Sample ID : BRD-1
Collected By :
Collection Date : 09/08/04 18:00

ESC Sample # : L168965-12

Site ID : OXBOW

Project # :

Parameter	Result	Det. Limit	Units	Method	Date	Dil.
Mercury	BDL	0.20	ug/l	7470A	09/14/04	1
Arsenic	BDL	10.	ug/l	6010B	09/18/04	1
Arsenic, Dissolved	BDL	10.	ug/l	6010B	09/16/04	1
Barium	130	5.0	ug/l	6010B	09/18/04	1
Barium, Dissolved	110	5.0	ug/l	6010B	09/16/04	1
Cadmium	BDL	5.0	ug/l	6010B	09/18/04	1
Cadmium, Dissolved	BDL	5.0	ug/l	6010B	09/16/04	1
Chromium	BDL	10.	ug/l	6010B	09/18/04	1
Chromium, Dissolved	BDL	10.	ug/l	6010B	09/16/04	1
Lead	BDL	5.0	ug/l	6010B	09/18/04	1
Lead, Dissolved	BDL	5.0	ug/l	6010B	09/17/04	1
Manganese	310	10.	ug/l	6010B	09/18/04	1
Manganese, Dissolved	BDL	10.	ug/l	6010B	09/16/04	1
Nickel	BDL	10.	ug/l	6010B	09/18/04	1
Nickel, Dissolved	BDL	10.	ug/l	6010B	09/16/04	1
Selenium	BDL	10.	ug/l	6010B	09/18/04	1
Selenium, Dissolved	BDL	10.	ug/l	6010B	09/16/04	1
Silver	BDL	5.0	ug/l	6010B	09/18/04	1
Silver, Dissolved	BDL	5.0	ug/l	6010B	09/16/04	1
Volatile Organics						
Acetone	BDL	50.	ug/l	8260B	09/14/04	1
Acrolein	BDL	50.	ug/l	8260B	09/14/04	1
Acrylonitrile	BDL	50.	ug/l	8260B	09/14/04	1
Allyl chloride	BDL	50.	ug/l	8260B	09/14/04	1
Benzene	BDL	1.0	ug/l	8260B	09/14/04	1
Bromobenzene	BDL	1.0	ug/l	8260B	09/14/04	1
Bromochloromethane	BDL	1.0	ug/l	8260B	09/14/04	1
Bromodichloromethane	BDL	1.0	ug/l	8260B	09/14/04	1
Bromoform	BDL	1.0	ug/l	8260B	09/14/04	1
Bromomethane	BDL	1.0	ug/l	8260B	09/14/04	1
2-Butanone (MEK)	BDL	50.	ug/l	8260B	09/14/04	1
n-Butylbenzene	BDL	1.0	ug/l	8260B	09/14/04	1
sec-Butylbenzene	BDL	1.0	ug/l	8260B	09/14/04	1
tert-Butylbenzene	BDL	1.0	ug/l	8260B	09/14/04	1
Carbon disulfide	BDL	1.0	ug/l	8260B	09/14/04	1
Carbon tetrachloride	BDL	1.0	ug/l	8260B	09/14/04	1
Chlorobenzene	BDL	1.0	ug/l	8260B	09/14/04	1

BDL - Below Detection Limit

Det. Limit - Estimated Quantitation Limit (EQL)

Laboratory Certification Numbers:

AIHA - 100789, AL - 40660, CA - I-2327, CT- PH-0197, FL - E87487, GA - 923, IN - C-TN-01
KY - 90010, KYUST - 0016, NC - ENV375, DW21704, ND - R-140, SC - 84004, TN - 2006, VA - 00109, WV - 233



ENVIRONMENTAL SCIENCE CORP.

12065 Lebanon Rd.
Mt. Juliet, TN 37122
(615) 758-5858
1-800-767-5859
Fax (615) 758-5859

Tax I.D. 62-0814289

Est. 1970

REPORT OF ANALYSIS

Mr. Mick Cossairt
Deffenbaugh Industries
18181 W. 53rd
Shawnee, KS 66203

September 22, 2004

Date Received : September 09, 2004
Description : ISC Oxbow Surface Water / Sediment
Sample ID : BRD-1
Collected By :
Collection Date : 09/08/04 18:00

ESC Sample # : L168965-12

Site ID : OXBOW

Project # :

Parameter	Result	Det. Limit	Units	Method	Date	Dil.
Chlorodibromomethane	BDL	1.0	ug/l	8260B	09/14/04	1
Chloroethane	BDL	1.0	ug/l	8260B	09/14/04	1
2-Chloroethyl vinyl ether	BDL	10.	ug/l	8260B	09/14/04	1
Chloroform	BDL	5.0	ug/l	8260B	09/14/04	1
Chloromethane	BDL	1.0	ug/l	8260B	09/14/04	1
2-Chlorotoluene	BDL	1.0	ug/l	8260B	09/14/04	1
4-Chlorotoluene	BDL	1.0	ug/l	8260B	09/14/04	1
1,2-Dibromo-3-Chloropropane	BDL	1.0	ug/l	8260B	09/14/04	1
1,2-Dibromoethane	BDL	1.0	ug/l	8260B	09/14/04	1
Dibromomethane	BDL	1.0	ug/l	8260B	09/14/04	1
1,2-Dichlorobenzene	BDL	1.0	ug/l	8260B	09/14/04	1
1,3-Dichlorobenzene	BDL	1.0	ug/l	8260B	09/14/04	1
1,4-Dichlorobenzene	BDL	1.0	ug/l	8260B	09/14/04	1
trans-1,4-Dichloro-2-butene	BDL	1.0	ug/l	8260B	09/14/04	1
Dichlorodifluoromethane	BDL	1.0	ug/l	8260B	09/14/04	1
1,1-Dichloroethane	BDL	1.0	ug/l	8260B	09/14/04	1
1,2-Dichloroethane	BDL	1.0	ug/l	8260B	09/14/04	1
1,1-Dichloroethene	BDL	1.0	ug/l	8260B	09/14/04	1
cis-1,2-Dichloroethene	BDL	1.0	ug/l	8260B	09/14/04	1
trans-1,2-Dichloroethene	BDL	1.0	ug/l	8260B	09/14/04	1
1,2-Dichloropropane	BDL	1.0	ug/l	8260B	09/14/04	1
1,3-Dichloropropane	BDL	1.0	ug/l	8260B	09/14/04	1
2,2-Dichloropropane	BDL	1.0	ug/l	8260B	09/14/04	1
1,1-Dichloropropene	BDL	1.0	ug/l	8260B	09/14/04	1
cis-1,3-Dichloropropene	BDL	1.0	ug/l	8260B	09/14/04	1
trans-1,3-Dichloropropene	BDL	1.0	ug/l	8260B	09/14/04	1
Di-isopropyl ether	BDL	1.0	ug/l	8260B	09/14/04	1
1,4-Dioxane	BDL	100	ug/l	8260B	09/14/04	1
Ethylbenzene	BDL	1.0	ug/l	8260B	09/14/04	1
Ethyl methacrylate	BDL	5.0	ug/l	8260B	09/14/04	1
Hexachlorobutadiene	BDL	1.0	ug/l	8260B	09/14/04	1
2-Hexanone	BDL	50.	ug/l	8260B	09/14/04	1
Iodomethane	BDL	50.	ug/l	8260B	09/14/04	1
Isopropylbenzene	BDL	1.0	ug/l	8260B	09/14/04	1
p-Isopropyltoluene	BDL	1.0	ug/l	8260B	09/14/04	1
Methacrylonitrile	BDL	50.	ug/l	8260B	09/14/04	1
Methylene Chloride	BDL	5.0	ug/l	8260B	09/14/04	1
Methyl methacrylate	BDL	50.	ug/l	8260B	09/14/04	1
4-Methyl-2-pentanone (MIBK)	BDL	50.	ug/l	8260B	09/14/04	1

BDL - Below Detection Limit

Det. Limit - Estimated Quantitation Limit (EQL)

Laboratory Certification Numbers:

AIHA - 100789, AL - 40660, CA - I-2327, CT- PH-0197, FL - E87487, GA - 923, IN - C-TN-01
KY - 90010, KYUST - 0016, NC - ENV375, DW21704, ND - R-140, SC - 84004, TN - 2006, VA - 00109, WV - 233



ENVIRONMENTAL
SCIENCE CORP.

12065 Lebanon Rd.
Mt. Juliet, TN 37122
(615) 758-5858
1-800-767-5859
Fax (615) 758-5859

Tax I.D. 62-0814289

Est. 1970

REPORT OF ANALYSIS

Mr. Mick Cossairt
Deffenbaugh Industries
18181 W. 53rd
Shawnee, KS 66203

September 22, 2004

Date Received : September 09, 2004
Description : ISC Oxbow Surface Water / Sediment
Sample ID : BRD-1
Collected By :
Collection Date : 09/08/04 18:00

ESC Sample # : L168965-12

Site ID : OXBOW

Project # :

Parameter	Result	Det. Limit	Units	Method	Date	Dil.
Methyl tert-butyl ether	BDL	1.0	ug/l	8260B	09/14/04	1
Naphthalene	BDL	5.0	ug/l	8260B	09/14/04	1
Pentachloroethane	BDL	50.	ug/l	8260B	09/14/04	1
Propionitrile	BDL	50.	ug/l	8260B	09/14/04	1
n-Propylbenzene	BDL	1.0	ug/l	8260B	09/14/04	1
Styrene	BDL	1.0	ug/l	8260B	09/14/04	1
1,1,2,2-Tetrachloroethane	BDL	1.0	ug/l	8260B	09/14/04	1
1,1,1,2-Tetrachloroethane	BDL	1.0	ug/l	8260B	09/14/04	1
Tetrachloroethene	BDL	1.0	ug/l	8260B	09/14/04	1
Toluene	BDL	5.0	ug/l	8260B	09/14/04	1
1,2,3-Trichlorobenzene	BDL	1.0	ug/l	8260B	09/14/04	1
1,2,4-Trichlorobenzene	BDL	1.0	ug/l	8260B	09/14/04	1
1,1,1-Trichloroethane	BDL	1.0	ug/l	8260B	09/14/04	1
1,1,2-Trichloroethane	BDL	1.0	ug/l	8260B	09/14/04	1
Trichloroethene	BDL	1.0	ug/l	8260B	09/14/04	1
Trichlorofluoromethane	BDL	1.0	ug/l	8260B	09/14/04	1
1,2,3-Trichloropropane	BDL	1.0	ug/l	8260B	09/14/04	1
1,2,4-Trimethylbenzene	BDL	1.0	ug/l	8260B	09/14/04	1
1,3,5-Trimethylbenzene	BDL	1.0	ug/l	8260B	09/14/04	1
Vinyl chloride	BDL	1.0	ug/l	8260B	09/14/04	1
Xylenes, Total	BDL	3.0	ug/l	8260B	09/14/04	1
Surrogate Recovery						
Toluene-d8	100		% Rec.	8260B	09/14/04	1
Dibromofluoromethane	110		% Rec.	8260B	09/14/04	1
4-Bromofluorobenzene	98.		% Rec.	8260B	09/14/04	1

Tom Mallette, ESC Representative

BDL - Below Detection Limit

Det. Limit - Estimated Quantitation Limit (EQL)

Laboratory Certification Numbers:

AIHA - 100789, AL - 40660, CA - I-2327, CT- PH-0197, FL - E87487, GA - 923, IN - C-TN-01
KY - 90010, KYUST - 0016, NC - ENV375, DW21704, ND - R-140, SC - 84004, TN - 2006, VA - 00109, WV - 233

Note:

The reported analytical results relate only to the sample submitted.

This report shall not be reproduced, except in full, without the written approval from ESC.

Reported: 09/20/04 16:50 Printed: 09/22/04 07:55



ENVIRONMENTAL SCIENCE CORP.

12065 Lebanon Rd.
Mt. Juliet, TN 37122
(615) 758-5858
1-800-767-5859
Fax (615) 758-5859

Tax I.D. 62-0814289

Est. 1970

REPORT OF ANALYSIS

Mr. Mick Cossairt
Deffenbaugh Industries
18181 W. 53rd
Shawnee, KS 66203

September 22, 2004

Date Received : September 09, 2004
Description : ISC Oxbow Surface Water / Sediment

ESC Sample # : L168965-13

Sample ID : FIELD BLK

Site ID : OXBOW

Collected By :
Collection Date : 09/08/04 12:30

Project # :

Parameter	Result	Det. Limit	Units	Method	Date	Dil.
Mercury	BDL	0.20	ug/l	7470A	09/14/04	1
Arsenic	BDL	10.	ug/l	6010B	09/18/04	1
Arsenic, Dissolved	BDL	10.	ug/l	6010B	09/16/04	1
Barium	BDL	5.0	ug/l	6010B	09/18/04	1
Barium, Dissolved	BDL	5.0	ug/l	6010B	09/16/04	1
Cadmium	BDL	5.0	ug/l	6010B	09/18/04	1
Cadmium, Dissolved	BDL	5.0	ug/l	6010B	09/16/04	1
Chromium	BDL	10.	ug/l	6010B	09/18/04	1
Chromium, Dissolved	BDL	10.	ug/l	6010B	09/16/04	1
Lead	BDL	5.0	ug/l	6010B	09/18/04	1
Lead, Dissolved	BDL	5.0	ug/l	6010B	09/17/04	1
Manganese	BDL	10.	ug/l	6010B	09/18/04	1
Manganese, Dissolved	BDL	10.	ug/l	6010B	09/16/04	1
Nickel	BDL	10.	ug/l	6010B	09/18/04	1
Nickel, Dissolved	BDL	10.	ug/l	6010B	09/16/04	1
Selenium	BDL	10.	ug/l	6010B	09/18/04	1
Selenium, Dissolved	BDL	10.	ug/l	6010B	09/16/04	1
Silver	BDL	5.0	ug/l	6010B	09/18/04	1
Silver, Dissolved	BDL	5.0	ug/l	6010B	09/16/04	1
Volatile Organics						
Acetone	BDL	50.	ug/l	8260B	09/14/04	1
Acrolein	BDL	50.	ug/l	8260B	09/14/04	1
Acrylonitrile	BDL	50.	ug/l	8260B	09/14/04	1
Allyl chloride	BDL	50.	ug/l	8260B	09/14/04	1
Benzene	BDL	1.0	ug/l	8260B	09/14/04	1
Bromobenzene	BDL	1.0	ug/l	8260B	09/14/04	1
Bromochloromethane	BDL	1.0	ug/l	8260B	09/14/04	1
Bromodichloromethane	BDL	1.0	ug/l	8260B	09/14/04	1
Bromoform	BDL	1.0	ug/l	8260B	09/14/04	1
Bromomethane	BDL	1.0	ug/l	8260B	09/14/04	1
2-Butanone (MEK)	BDL	50.	ug/l	8260B	09/14/04	1
n-Butylbenzene	BDL	1.0	ug/l	8260B	09/14/04	1
sec-Butylbenzene	BDL	1.0	ug/l	8260B	09/14/04	1
tert-Butylbenzene	BDL	1.0	ug/l	8260B	09/14/04	1
Carbon disulfide	BDL	1.0	ug/l	8260B	09/14/04	1
Carbon tetrachloride	BDL	1.0	ug/l	8260B	09/14/04	1
Chlorobenzene	BDL	1.0	ug/l	8260B	09/14/04	1

BDL - Below Detection Limit

Det. Limit - Estimated Quantitation Limit (EQL)

Laboratory Certification Numbers:

AIHA - 100789, AL - 40660, CA - I-2327, CT- PH-0197, FL - E87487, GA - 923, IN - C-TN-01
KY - 90010, KYUST - 0016, NC - ENV375, DW21704, ND - R-140, SC - 84004, TN - 2006, VA - 00109, WV - 233



ENVIRONMENTAL SCIENCE CORP.

12065 Lebanon Rd.
Mt. Juliet, TN 37122
(615) 758-5858
1-800-767-5859
Fax (615) 758-5859

Tax I.D. 62-0814289

Est. 1970

REPORT OF ANALYSIS

Mr. Mick Cossairt
Deffenbaugh Industries
18181 W. 53rd
Shawnee, KS 66203

September 22, 2004

Date Received : September 09, 2004
Description : ISC Oxbow Surface Water / Sediment
Sample ID : FIELD BLK
Collected By :
Collection Date : 09/08/04 12:30

ESC Sample # : L168965-13

Site ID : OXBOW

Project # :

Parameter	Result	Det. Limit	Units	Method	Date	Dil.
Chlorodibromomethane	BDL	1.0	ug/l	8260B	09/14/04	1
Chloroethane	BDL	1.0	ug/l	8260B	09/14/04	1
2-Chloroethyl vinyl ether	BDL	10.	ug/l	8260B	09/14/04	1
Chloroform	BDL	5.0	ug/l	8260B	09/14/04	1
Chloromethane	BDL	1.0	ug/l	8260B	09/14/04	1
2-Chlorotoluene	BDL	1.0	ug/l	8260B	09/14/04	1
4-Chlorotoluene	BDL	1.0	ug/l	8260B	09/14/04	1
1,2-Dibromo-3-Chloropropane	BDL	1.0	ug/l	8260B	09/14/04	1
1,2-Dibromoethane	BDL	1.0	ug/l	8260B	09/14/04	1
Dibromomethane	BDL	1.0	ug/l	8260B	09/14/04	1
1,2-Dichlorobenzene	BDL	1.0	ug/l	8260B	09/14/04	1
1,3-Dichlorobenzene	BDL	1.0	ug/l	8260B	09/14/04	1
1,4-Dichlorobenzene	BDL	1.0	ug/l	8260B	09/14/04	1
trans-1,4-Dichloro-2-butene	BDL	1.0	ug/l	8260B	09/14/04	1
Dichlorodifluoromethane	BDL	1.0	ug/l	8260B	09/14/04	1
1,1-Dichloroethane	BDL	1.0	ug/l	8260B	09/14/04	1
1,2-Dichloroethane	BDL	1.0	ug/l	8260B	09/14/04	1
1,1-Dichloroethene	BDL	1.0	ug/l	8260B	09/14/04	1
cis-1,2-Dichloroethene	BDL	1.0	ug/l	8260B	09/14/04	1
trans-1,2-Dichloroethene	BDL	1.0	ug/l	8260B	09/14/04	1
1,2-Dichloropropane	BDL	1.0	ug/l	8260B	09/14/04	1
1,3-Dichloropropane	BDL	1.0	ug/l	8260B	09/14/04	1
2,2-Dichloropropane	BDL	1.0	ug/l	8260B	09/14/04	1
1,1-Dichloropropene	BDL	1.0	ug/l	8260B	09/14/04	1
cis-1,3-Dichloropropene	BDL	1.0	ug/l	8260B	09/14/04	1
trans-1,3-Dichloropropene	BDL	1.0	ug/l	8260B	09/14/04	1
Di-isopropyl ether	BDL	1.0	ug/l	8260B	09/14/04	1
1,4-Dioxane	BDL	100	ug/l	8260B	09/14/04	1
Ethylbenzene	BDL	1.0	ug/l	8260B	09/14/04	1
Ethyl methacrylate	BDL	5.0	ug/l	8260B	09/14/04	1
Hexachlorobutadiene	BDL	1.0	ug/l	8260B	09/14/04	1
2-Hexanone	BDL	50.	ug/l	8260B	09/14/04	1
Iodomethane	BDL	50.	ug/l	8260B	09/14/04	1
Isopropylbenzene	BDL	1.0	ug/l	8260B	09/14/04	1
p-Isopropyltoluene	BDL	1.0	ug/l	8260B	09/14/04	1
Methacrylonitrile	BDL	50.	ug/l	8260B	09/14/04	1
Methylene Chloride	BDL	5.0	ug/l	8260B	09/14/04	1
Methyl methacrylate	BDL	50.	ug/l	8260B	09/14/04	1
4-Methyl-2-pentanone (MIBK)	BDL	50.	ug/l	8260B	09/14/04	1

BDL - Below Detection Limit

Det. Limit - Estimated Quantitation Limit(EQL)

Laboratory Certification Numbers:

AIHA - 100789, AL - 40660, CA - I-2327, CT- PH-0197, FL - E87487, GA - 923, IN - C-TN-01
KY - 90010, KYUST - 0016, NC - ENV375, DW21704, ND - R-140, SC - 84004, TN - 2006, VA - 00109, WV - 233



ENVIRONMENTAL
SCIENCE CORP.

12065 Lebanon Rd.
Mt. Juliet, TN 37122
(615) 758-5858
1-800-767-5859
Fax (615) 758-5859

Tax I.D. 62-0814289

Est. 1970

REPORT OF ANALYSIS

Mr. Mick Cossairt
Deffenbaugh Industries
18181 W. 53rd
Shawnee, KS 66203

September 22, 2004

Date Received : September 09, 2004
Description : ISC Oxbow Surface Water / Sediment

ESC Sample # : L168965-13

Sample ID : FIELD BLK

Site ID : OXBOW

Collected By :
Collection Date : 09/08/04 12:30

Project # :

Parameter	Result	Det. Limit	Units	Method	Date	Dil.
Methyl tert-butyl ether	BDL	1.0	ug/l	8260B	09/14/04	1
Naphthalene	BDL	5.0	ug/l	8260B	09/14/04	1
Pentachloroethane	BDL	50.	ug/l	8260B	09/14/04	1
Propionitrile	BDL	50.	ug/l	8260B	09/14/04	1
n-Propylbenzene	BDL	1.0	ug/l	8260B	09/14/04	1
Styrene	BDL	1.0	ug/l	8260B	09/14/04	1
1,1,2,2-Tetrachloroethane	BDL	1.0	ug/l	8260B	09/14/04	1
1,1,1,2-Tetrachloroethane	BDL	1.0	ug/l	8260B	09/14/04	1
Tetrachloroethene	BDL	1.0	ug/l	8260B	09/14/04	1
Toluene	BDL	5.0	ug/l	8260B	09/14/04	1
1,2,3-Trichlorobenzene	BDL	1.0	ug/l	8260B	09/14/04	1
1,2,4-Trichlorobenzene	BDL	1.0	ug/l	8260B	09/14/04	1
1,1,1-Trichloroethane	BDL	1.0	ug/l	8260B	09/14/04	1
1,1,2-Trichloroethane	BDL	1.0	ug/l	8260B	09/14/04	1
Trichloroethene	BDL	1.0	ug/l	8260B	09/14/04	1
Trichlorofluoromethane	BDL	1.0	ug/l	8260B	09/14/04	1
1,2,3-Trichloropropane	BDL	1.0	ug/l	8260B	09/14/04	1
1,2,4-Trimethylbenzene	BDL	1.0	ug/l	8260B	09/14/04	1
1,3,5-Trimethylbenzene	BDL	1.0	ug/l	8260B	09/14/04	1
Vinyl chloride	BDL	1.0	ug/l	8260B	09/14/04	1
Xylenes, Total	BDL	3.0	ug/l	8260B	09/14/04	1
Surrogate Recovery						
Toluene-d8	100		% Rec.	8260B	09/14/04	1
Dibromofluoromethane	110		% Rec.	8260B	09/14/04	1
4-Bromofluorobenzene	98.		% Rec.	8260B	09/14/04	1

Tom Mellette, ESC Representative

BDL - Below Detection Limit

Det. Limit - Estimated Quantitation Limit (EQL)

Laboratory Certification Numbers:

AIHA - 100789, AL - 40660, CA - I-2327, CT- PH-0197, FL - E87487, GA - 923, IN - C-TN-01
KY - 90010, KYUST - 0016, NC - ENV375, DW21704, ND - R-140, SC - 84004, TN - 2006, VA - 00109, WV - 233

Note:

The reported analytical results relate only to the sample submitted.

This report shall not be reproduced, except in full, without the written approval from ESC.

Reported: 09/20/04 16:50 Printed: 09/22/04 07:55



ENVIRONMENTAL SCIENCE CORP.

12065 Lebanon Rd.
Mt. Juliet, TN 37122
(615) 758-5858
1-800-767-5859
Fax (615) 758-5859

Tax I.D. 62-0814289

Est. 1970

REPORT OF ANALYSIS

Mr. Mick Cossairt
Deffenbaugh Industries
18181 W. 53rd
Shawnee, KS 66203

September 22, 2004

Date Received : September 09, 2004
Description : ISC Oxbow Surface Water / Sediment
Sample ID : DUP
Collected By :
Collection Date : 09/08/04 12:30

ESC Sample # : L168965-14

Site ID : OXBOW

Project # :

Parameter	Result	Det. Limit	Units	Method	Date	Dil.
Mercury	BDL	0.20	ug/l	7470A	09/14/04	1
Arsenic	BDL	10.	ug/l	6010B	09/18/04	1
Arsenic, Dissolved	BDL	10.	ug/l	6010B	09/16/04	1
Barium	110	5.0	ug/l	6010B	09/18/04	1
Barium, Dissolved	95.	5.0	ug/l	6010B	09/16/04	1
Cadmium	BDL	5.0	ug/l	6010B	09/18/04	1
Cadmium, Dissolved	BDL	5.0	ug/l	6010B	09/16/04	1
Chromium	BDL	10.	ug/l	6010B	09/18/04	1
Chromium, Dissolved	BDL	10.	ug/l	6010B	09/16/04	1
Lead	BDL	5.0	ug/l	6010B	09/18/04	1
Lead, Dissolved	BDL	5.0	ug/l	6010B	09/17/04	1
Manganese	740	10.	ug/l	6010B	09/18/04	1
Manganese, Dissolved	15.	10.	ug/l	6010B	09/16/04	1
Nickel	BDL	10.	ug/l	6010B	09/18/04	1
Nickel, Dissolved	BDL	10.	ug/l	6010B	09/16/04	1
Selenium	18.	10.	ug/l	6010B	09/18/04	1
Selenium, Dissolved	BDL	10.	ug/l	6010B	09/16/04	1
Silver	BDL	5.0	ug/l	6010B	09/18/04	1
Silver, Dissolved	BDL	5.0	ug/l	6010B	09/16/04	1
Volatile Organics						
Acetone	BDL	50.	ug/l	8260B	09/14/04	1
Acrolein	BDL	50.	ug/l	8260B	09/14/04	1
Acrylonitrile	BDL	50.	ug/l	8260B	09/14/04	1
Allyl chloride	BDL	50.	ug/l	8260B	09/14/04	1
Benzene	BDL	1.0	ug/l	8260B	09/14/04	1
Bromobenzene	BDL	1.0	ug/l	8260B	09/14/04	1
Bromochloromethane	BDL	1.0	ug/l	8260B	09/14/04	1
Bromodichloromethane	BDL	1.0	ug/l	8260B	09/14/04	1
Bromoform	BDL	1.0	ug/l	8260B	09/14/04	1
Bromomethane	BDL	1.0	ug/l	8260B	09/14/04	1
2-Butanone (MEK)	BDL	50.	ug/l	8260B	09/14/04	1
n-Butylbenzene	BDL	1.0	ug/l	8260B	09/14/04	1
sec-Butylbenzene	BDL	1.0	ug/l	8260B	09/14/04	1
tert-Butylbenzene	BDL	1.0	ug/l	8260B	09/14/04	1
Carbon disulfide	BDL	1.0	ug/l	8260B	09/14/04	1
Carbon tetrachloride	BDL	1.0	ug/l	8260B	09/14/04	1
Chlorobenzene	BDL	1.0	ug/l	8260B	09/14/04	1

BDL - Below Detection Limit

Det. Limit - Estimated Quantitation Limit (EQL)

Laboratory Certification Numbers:

AIHA - 100789, AL - 40660, CA - I-2327, CT - PH-0197, FL - E87487, GA - 923, IN - C-TN-01
KY - 90010, KYUST - 0016, NC - ENV375, DW21704, ND - R-140, SC - 84004, TN - 2006, VA - 00109, WV - 233



ENVIRONMENTAL SCIENCE CORP.

12065 Lebanon Rd.
Mt. Juliet, TN 37122
(615) 758-5858
1-800-767-5859
Fax (615) 758-5859

Tax I.D. 62-0814289

Est. 1970

REPORT OF ANALYSIS

Mr. Mick Cossairt
Deffenbaugh Industries
18181 W. 53rd
Shawnee, KS 66203

September 22, 2004

Date Received : September 09, 2004
Description : ISC Oxbow Surface Water / Sediment
Sample ID : DUP
Collected By :
Collection Date : 09/08/04 12:30

ESC Sample # : L168965-14

Site ID : OXBOW

Project # :

Parameter	Result	Det. Limit	Units	Method	Date	Dil.
Chlorodibromomethane	BDL	1.0	ug/l	8260B	09/14/04	1
Chloroethane	BDL	1.0	ug/l	8260B	09/14/04	1
2-Chloroethyl vinyl ether	BDL	10.	ug/l	8260B	09/14/04	1
Chloroform	BDL	5.0	ug/l	8260B	09/14/04	1
Chloromethane	BDL	1.0	ug/l	8260B	09/14/04	1
2-Chlorotoluene	BDL	1.0	ug/l	8260B	09/14/04	1
4-Chlorotoluene	BDL	1.0	ug/l	8260B	09/14/04	1
1,2-Dibromo-3-Chloropropane	BDL	1.0	ug/l	8260B	09/14/04	1
1,2-Dibromoethane	BDL	1.0	ug/l	8260B	09/14/04	1
Dibromomethane	BDL	1.0	ug/l	8260B	09/14/04	1
1,2-Dichlorobenzene	BDL	1.0	ug/l	8260B	09/14/04	1
1,3-Dichlorobenzene	BDL	1.0	ug/l	8260B	09/14/04	1
1,4-Dichlorobenzene	BDL	1.0	ug/l	8260B	09/14/04	1
trans-1,4-Dichloro-2-butene	BDL	1.0	ug/l	8260B	09/14/04	1
Dichlorodifluoromethane	BDL	1.0	ug/l	8260B	09/14/04	1
1,1-Dichloroethane	BDL	1.0	ug/l	8260B	09/14/04	1
1,2-Dichloroethane	BDL	1.0	ug/l	8260B	09/14/04	1
1,1-Dichloroethene	BDL	1.0	ug/l	8260B	09/14/04	1
cis-1,2-Dichloroethene	BDL	1.0	ug/l	8260B	09/14/04	1
trans-1,2-Dichloroethene	BDL	1.0	ug/l	8260B	09/14/04	1
1,2-Dichloropropane	BDL	1.0	ug/l	8260B	09/14/04	1
1,3-Dichloropropane	BDL	1.0	ug/l	8260B	09/14/04	1
2,2-Dichloropropane	BDL	1.0	ug/l	8260B	09/14/04	1
1,1-Dichloropropene	BDL	1.0	ug/l	8260B	09/14/04	1
cis-1,3-Dichloropropene	BDL	1.0	ug/l	8260B	09/14/04	1
trans-1,3-Dichloropropene	BDL	1.0	ug/l	8260B	09/14/04	1
Di-isopropyl ether	BDL	1.0	ug/l	8260B	09/14/04	1
1,4-Dioxane	BDL	100	ug/l	8260B	09/14/04	1
Ethylbenzene	BDL	1.0	ug/l	8260B	09/14/04	1
Ethyl methacrylate	BDL	5.0	ug/l	8260B	09/14/04	1
Hexachlorobutadiene	BDL	1.0	ug/l	8260B	09/14/04	1
2-Hexanone	BDL	50.	ug/l	8260B	09/14/04	1
Iodomethane	BDL	50.	ug/l	8260B	09/14/04	1
Isopropylbenzene	BDL	1.0	ug/l	8260B	09/14/04	1
p-Isopropyltoluene	BDL	1.0	ug/l	8260B	09/14/04	1
Methacrylonitrile	BDL	50.	ug/l	8260B	09/14/04	1
Methylene Chloride	BDL	5.0	ug/l	8260B	09/14/04	1
Methyl methacrylate	BDL	50.	ug/l	8260B	09/14/04	1
4-Methyl-2-pentanone (MIBK)	BDL	50.	ug/l	8260B	09/14/04	1

BDL - Below Detection Limit

Det. Limit - Estimated Quantitation Limit(EQL)

Laboratory Certification Numbers:

AIHA - 100789, AL - 40660, CA - I-2327, CT- PH-0197, FL - E87487, GA - 923, IN - C-TN-01
KY - 90010, KYUST - 0016, NC - ENV375, DW21704, ND - R-140, SC - 84004, TN - 2006, VA - 00109, WV - 233



ENVIRONMENTAL
SCIENCE CORP.

12065 Lebanon Rd.
Mt. Juliet, TN 37122
(615) 758-5858
1-800-767-5859
Fax (615) 758-5859

Tax I.D. 62-0814289

Est. 1970

REPORT OF ANALYSIS

September 22, 2004

Mr. Mick Cossairt
Deffenbaugh Industries
18181 W. 53rd
Shawnee, KS 66203

Date Received : September 09, 2004
Description : ISC Oxbow Surface Water / Sediment
Sample ID : DUP
Collected By :
Collection Date : 09/08/04 12:30

ESC Sample # : L168965-14

Site ID : OXBOW

Project # :

Parameter	Result	Det. Limit	Units	Method	Date	Dil.
Methyl tert-butyl ether	BDL	1.0	ug/l	8260B	09/14/04	1
Naphthalene	BDL	5.0	ug/l	8260B	09/14/04	1
Pentachloroethane	BDL	50.	ug/l	8260B	09/14/04	1
Propionitrile	BDL	50.	ug/l	8260B	09/14/04	1
n-Propylbenzene	BDL	1.0	ug/l	8260B	09/14/04	1
Styrene	BDL	1.0	ug/l	8260B	09/14/04	1
1,1,2,2-Tetrachloroethane	BDL	1.0	ug/l	8260B	09/14/04	1
1,1,1,2-Tetrachloroethane	BDL	1.0	ug/l	8260B	09/14/04	1
Tetrachloroethene	BDL	1.0	ug/l	8260B	09/14/04	1
Toluene	BDL	5.0	ug/l	8260B	09/14/04	1
1,2,3-Trichlorobenzene	BDL	1.0	ug/l	8260B	09/14/04	1
1,2,4-Trichlorobenzene	BDL	1.0	ug/l	8260B	09/14/04	1
1,1,1-Trichloroethane	BDL	1.0	ug/l	8260B	09/14/04	1
1,1,2-Trichloroethane	BDL	1.0	ug/l	8260B	09/14/04	1
Trichloroethene	BDL	1.0	ug/l	8260B	09/14/04	1
Trichlorofluoromethane	BDL	1.0	ug/l	8260B	09/14/04	1
1,2,3-Trichloropropane	BDL	1.0	ug/l	8260B	09/14/04	1
1,2,4-Trimethylbenzene	BDL	1.0	ug/l	8260B	09/14/04	1
1,3,5-Trimethylbenzene	BDL	1.0	ug/l	8260B	09/14/04	1
Vinyl chloride	BDL	1.0	ug/l	8260B	09/14/04	1
Xylenes, Total	BDL	3.0	ug/l	8260B	09/14/04	1
Surrogate Recovery						
Toluene-d8	100		% Rec.	8260B	09/14/04	1
Dibromofluoromethane	100		% Rec.	8260B	09/14/04	1
4-Bromofluorobenzene	99.		% Rec.	8260B	09/14/04	1

Tom Mellette, ESC Representative

BDL - Below Detection Limit

Det. Limit - Estimated Quantitation Limit (EQL)

Laboratory Certification Numbers:

AIHA - 100789, AL - 40660, CA - I-2327, CT- PH-0197, FL - E87487, GA - 923, IN - C-TN-01
KY - 90010, KYUST - 0016, NC - ENV375, DW21704, ND - R-140, SC - 84004, TN - 2006, VA - 00109, WV - 233

Note:

The reported analytical results relate only to the sample submitted.

This report shall not be reproduced, except in full, without the written approval from ESC.

Reported: 09/20/04 16:50 Printed: 09/22/04 07:55



ENVIRONMENTAL SCIENCE CORP.

12065 Lebanon Rd.
Mt. Juliet, TN 37122
(615) 758-5858
1-800-767-5859
Fax (615) 758-5859

Tax I.D. 62-0814289

Est. 1970

REPORT OF ANALYSIS

Mr. Mick Cossairt
Deffenbaugh Industries
18181 W. 53rd
Shawnee, KS 66203

September 22, 2004

Date Received : September 09, 2004
Description : ISC Oxbow Surface Water / Sediment
Sample ID : TRIP BLANK
Collected By :
Collection Date : 09/08/04 00:00

ESC Sample # : L168965-15

Site ID : OXBOW

Project # :

Parameter	Result	Det. Limit	Units	Method	Date	Dil.
Volatile Organics						
Acetone	BDL	50.	ug/l	8260B	09/14/04	1
Acrolein	BDL	50.	ug/l	8260B	09/14/04	1
Acrylonitrile	BDL	50.	ug/l	8260B	09/14/04	1
Allyl chloride	BDL	50.	ug/l	8260B	09/14/04	1
Benzene	BDL	1.0	ug/l	8260B	09/14/04	1
Bromobenzene	BDL	1.0	ug/l	8260B	09/14/04	1
Bromochloromethane	BDL	1.0	ug/l	8260B	09/14/04	1
Bromodichloromethane	BDL	1.0	ug/l	8260B	09/14/04	1
Bromoform	BDL	1.0	ug/l	8260B	09/14/04	1
Bromomethane	BDL	1.0	ug/l	8260B	09/14/04	1
2-Butanone (MEK)	BDL	50.	ug/l	8260B	09/14/04	1
n-Butylbenzene	BDL	1.0	ug/l	8260B	09/14/04	1
sec-Butylbenzene	BDL	1.0	ug/l	8260B	09/14/04	1
tert-Butylbenzene	BDL	1.0	ug/l	8260B	09/14/04	1
Carbon disulfide	BDL	1.0	ug/l	8260B	09/14/04	1
Carbon tetrachloride	BDL	1.0	ug/l	8260B	09/14/04	1
Chlorobenzene	BDL	1.0	ug/l	8260B	09/14/04	1
Chlorodibromomethane	BDL	1.0	ug/l	8260B	09/14/04	1
Chloroethane	BDL	1.0	ug/l	8260B	09/14/04	1
2-Chloroethyl vinyl ether	BDL	10.	ug/l	8260B	09/14/04	1
Chloroform	BDL	5.0	ug/l	8260B	09/14/04	1
Chloromethane	BDL	1.0	ug/l	8260B	09/14/04	1
2-Chlorotoluene	BDL	1.0	ug/l	8260B	09/14/04	1
4-Chlorotoluene	BDL	1.0	ug/l	8260B	09/14/04	1
1,2-Dibromo-3-Chloropropane	BDL	1.0	ug/l	8260B	09/14/04	1
1,2-Dibromoethane	BDL	1.0	ug/l	8260B	09/14/04	1
Dibromomethane	BDL	1.0	ug/l	8260B	09/14/04	1
1,2-Dichlorobenzene	BDL	1.0	ug/l	8260B	09/14/04	1
1,3-Dichlorobenzene	BDL	1.0	ug/l	8260B	09/14/04	1
1,4-Dichlorobenzene	BDL	1.0	ug/l	8260B	09/14/04	1
trans-1,4-Dichloro-2-butene	BDL	1.0	ug/l	8260B	09/14/04	1
Dichlorodifluoromethane	BDL	1.0	ug/l	8260B	09/14/04	1
1,1-Dichloroethane	BDL	1.0	ug/l	8260B	09/14/04	1
1,2-Dichloroethane	BDL	1.0	ug/l	8260B	09/14/04	1
1,1-Dichloroethene	BDL	1.0	ug/l	8260B	09/14/04	1
cis-1,2-Dichloroethene	BDL	1.0	ug/l	8260B	09/14/04	1
trans-1,2-Dichloroethene	BDL	1.0	ug/l	8260B	09/14/04	1
1,2-Dichloropropane	BDL	1.0	ug/l	8260B	09/14/04	1

BDL - Below Detection Limit

Det. Limit - Estimated Quantitation Limit (EQL)

Laboratory Certification Numbers:

AIHA - 100789, AL - 40660, CA - I-2327, CT- PH-0197, FL - E87487, GA - 923, IN - C-TN-01
KY - 90010, KYUST - 0016, NC - ENV375, DW21704, ND - R-140, SC - 84004, TN - 2006, VA - 00109, WV - 233



ENVIRONMENTAL
SCIENCE CORP.

12065 Lebanon Rd.
Mt. Juliet, TN 37122
(615) 758-5858
1-800-767-5859
Fax (615) 758-5859

Tax I.D. 62-0814289

Est. 1970

REPORT OF ANALYSIS

September 22, 2004

Mr. Mick Cossairt
Deffenbaugh Industries
18181 W. 53rd
Shawnee, KS 66203

Date Received : September 09, 2004
Description : ISC Oxbow Surface Water / Sediment
Sample ID : TRIP BLANK
Collected By :
Collection Date : 09/08/04 00:00

ESC Sample # : L168965-15

Site ID : OXBOW

Project # :

Parameter	Result	Det. Limit	Units	Method	Date	Dil.
1,3-Dichloropropane	BDL	1.0	ug/l	8260B	09/14/04	1
2,2-Dichloropropane	BDL	1.0	ug/l	8260B	09/14/04	1
1,1-Dichloropropene	BDL	1.0	ug/l	8260B	09/14/04	1
cis-1,3-Dichloropropene	BDL	1.0	ug/l	8260B	09/14/04	1
trans-1,3-Dichloropropene	BDL	1.0	ug/l	8260B	09/14/04	1
Di-isopropyl ether	BDL	1.0	ug/l	8260B	09/14/04	1
1,4-Dioxane	BDL	100	ug/l	8260B	09/14/04	1
Ethylbenzene	BDL	1.0	ug/l	8260B	09/14/04	1
Ethyl methacrylate	BDL	5.0	ug/l	8260B	09/14/04	1
Hexachlorobutadiene	BDL	1.0	ug/l	8260B	09/14/04	1
2-Hexanone	BDL	50.	ug/l	8260B	09/14/04	1
Iodomethane	BDL	50.	ug/l	8260B	09/14/04	1
Isopropylbenzene	BDL	1.0	ug/l	8260B	09/14/04	1
p-Isopropyltoluene	BDL	1.0	ug/l	8260B	09/14/04	1
Methacrylonitrile	BDL	50.	ug/l	8260B	09/14/04	1
Methylene Chloride	BDL	5.0	ug/l	8260B	09/14/04	1
Methyl methacrylate	BDL	50.	ug/l	8260B	09/14/04	1
4-Methyl-2-pentanone (MIBK)	BDL	50.	ug/l	8260B	09/14/04	1
Methyl tert-butyl ether	BDL	1.0	ug/l	8260B	09/14/04	1
Naphthalene	BDL	5.0	ug/l	8260B	09/14/04	1
Pentachloroethane	BDL	50.	ug/l	8260B	09/14/04	1
Propionitrile	BDL	50.	ug/l	8260B	09/14/04	1
n-Propylbenzene	BDL	1.0	ug/l	8260B	09/14/04	1
Styrene	BDL	1.0	ug/l	8260B	09/14/04	1
1,1,2,2-Tetrachloroethane	BDL	1.0	ug/l	8260B	09/14/04	1
1,1,1,2-Tetrachloroethane	BDL	1.0	ug/l	8260B	09/14/04	1
Tetrachloroethene	BDL	1.0	ug/l	8260B	09/14/04	1
Toluene	BDL	5.0	ug/l	8260B	09/14/04	1
1,2,3-Trichlorobenzene	BDL	1.0	ug/l	8260B	09/14/04	1
1,2,4-Trichlorobenzene	BDL	1.0	ug/l	8260B	09/14/04	1
1,1,1-Trichloroethane	BDL	1.0	ug/l	8260B	09/14/04	1
1,1,2-Trichloroethane	BDL	1.0	ug/l	8260B	09/14/04	1
Trichloroethene	BDL	1.0	ug/l	8260B	09/14/04	1
Trichlorofluoromethane	BDL	1.0	ug/l	8260B	09/14/04	1
1,2,3-Trichloropropane	BDL	1.0	ug/l	8260B	09/14/04	1
1,2,4-Trimethylbenzene	BDL	1.0	ug/l	8260B	09/14/04	1
1,3,5-Trimethylbenzene	BDL	1.0	ug/l	8260B	09/14/04	1
Vinyl chloride	BDL	1.0	ug/l	8260B	09/14/04	1
Xylenes, Total	BDL	3.0	ug/l	8260B	09/14/04	1

BDL - Below Detection Limit

Det. Limit - Estimated Quantitation Limit (EQL)

Laboratory Certification Numbers:

AIHA - 100789, AL - 40660, CA - I-2327, CT- PH-0197, FL - E87487, GA - 923, IN - C-TN-01
KY - 90010, KYUST - 0016, NC - ENV375, DW21704, ND - R-140, SC - 84004, TN - 2006, VA - 00109, WV - 233



ENVIRONMENTAL
SCIENCE CORP.

12065 Lebanon Rd.
Mt. Juliet, TN 37122
(615) 758-5858
1-800-767-5859
Fax (615) 758-5859

Tax I.D. 62-0814289

Est. 1970

REPORT OF ANALYSIS

Mr. Mick Cossairt
Deffenbaugh Industries
18181 W. 53rd
Shawnee, KS 66203

September 22, 2004

Date Received : September 09, 2004
Description : ISC Oxbow Surface Water / Sediment
Sample ID : TRIP BLANK
Collected By :
Collection Date : 09/08/04 00:00

ESC Sample # : L168965-15

Site ID : OXBOW

Project # :

Parameter	Result	Det. Limit	Units	Method	Date	Dil.
Surrogate Recovery						
Toluene-d8	100		% Rec.	8260B	09/14/04	1
Dibromofluoromethane	110		% Rec.	8260B	09/14/04	1
4-Bromofluorobenzene	99.		% Rec.	8260B	09/14/04	1

Tom Mellette, ESC Representative

BDL - Below Detection Limit

Det. Limit - Estimated Quantitation Limit (EQL)

Laboratory Certification Numbers:

AIHA - 100789, AL - 40660, CA - I-2327, CT- PH-0197, FL - E87487, GA - 923, IN - C-TN-01
KY - 90010, KYUST - 0016, NC - ENV375, DW21704, ND - R-140, SC - 84004, TN - 2006, VA - 00109, WV - 233

Note:

The reported analytical results relate only to the sample submitted.

This report shall not be reproduced, except in full, without the written approval from ESC.

Reported: 09/20/04 16:50 Printed: 09/22/04 07:55

Attachment A
List of Analytes with QC Qualifiers

Sample #	Analyte	Qualifier
L168965-01	2-Butanone (MEK)	J3
	Carbon disulfide	J4
	Chloroethane	J5J3
	1,2-Dibromo-3-Chloropropane	J3
	1,2-Dichlorobenzene	J4
	trans-1,4-Dichloro-2-butene	J4J5J3
	Methyl tert-butyl ether	J4
	Toluene	J4
	1,2,3-Trichlorobenzene	J4
	1,2,4-Trichlorobenzene	J4
	1,2,4-Trimethylbenzene	J4
	Xylenes, Total	J4
L168965-02	Carbon disulfide	J4
	1,2-Dichlorobenzene	J4
	trans-1,4-Dichloro-2-butene	J4
	1,2-Dichloropropane	J3
	Methyl tert-butyl ether	J4J3
	Toluene	J4J3
	1,2,3-Trichlorobenzene	J4
	1,2,4-Trichlorobenzene	J4
	1,2,3-Trichloropropane	J3
	1,2,4-Trimethylbenzene	J4J3
	Xylenes, Total	J4J3
L168965-03	Carbon disulfide	J4
	1,2-Dichlorobenzene	J4
	trans-1,4-Dichloro-2-butene	J4
	1,2-Dichloropropane	J3
	Methyl tert-butyl ether	J4J3
	Toluene	J4J3
	1,2,3-Trichlorobenzene	J4
	1,2,4-Trichlorobenzene	J4
	1,2,3-Trichloropropane	J3
	1,2,4-Trimethylbenzene	J4J3
	Xylenes, Total	J4J3
L168965-04	Carbon disulfide	J4
	1,2-Dichlorobenzene	J4
	trans-1,4-Dichloro-2-butene	J4
	1,2-Dichloropropane	J3
	Methyl tert-butyl ether	J4J3
	Toluene	J4J3
	1,2,3-Trichlorobenzene	J4
	1,2,4-Trichlorobenzene	J4
	1,2,3-Trichloropropane	J3
	1,2,4-Trimethylbenzene	J4J3
	Xylenes, Total	J4J3
L168965-05	Carbon disulfide	J4
	1,2-Dichlorobenzene	J4
	trans-1,4-Dichloro-2-butene	J4
	1,2-Dichloropropane	J3
	Methyl tert-butyl ether	J4J3
	Toluene	J4J3
	1,2,3-Trichlorobenzene	J4
	1,2,4-Trichlorobenzene	J4
	1,2,3-Trichloropropane	J3
	1,2,4-Trimethylbenzene	J4J3
	Xylenes, Total	J4J3
L168965-06	2-Chloroethyl vinyl ether	J4
	1,4-Dichlorobenzene	J4
	Methyl tert-butyl ether	J4
	Manganese	J6
	Silver	J6
	Silver, Dissolved	J6J3
	2-Chloroethyl vinyl ether	J4
	1,4-Dichlorobenzene	J4
	Iodomethane	J6
	Methyl tert-butyl ether	J4
L168965-07	2-Chloroethyl vinyl ether	J4
	1,4-Dichlorobenzene	J4
	Methyl tert-butyl ether	J4
L168965-08	2-Chloroethyl vinyl ether	J4
	1,4-Dichlorobenzene	J4
	Methyl tert-butyl ether	J4
L168965-09	2-Chloroethyl vinyl ether	J4
	1,4-Dichlorobenzene	J4
	Methyl tert-butyl ether	J4
L168965-10	2-Chloroethyl vinyl ether	J4
	1,4-Dichlorobenzene	J4
	Methyl tert-butyl ether	J4
L168965-11	2-Chloroethyl vinyl ether	J4
	1,4-Dichlorobenzene	J4

Attachment A
List of Analytes with QC Qualifiers

Sample #	Analyte	Qualifier
L168965-12	Methyl tert-butyl ether	J4
	Acetone	J4
	Chloroethane	J4
	Chloromethane	J4
	Dichlorodifluoromethane	J4
	1,2-Dichloroethane	J4
	1,2-Dichloropropane	J3
	Trichlorofluoromethane	J4
	Vinyl chloride	J4
	Acetone	J4
L168965-13	Bromomethane	J3
	Chloroethane	J4J5
	Chloromethane	J4J5
	Dichlorodifluoromethane	J4J5
	1,2-Dichloroethane	J4
	Trichlorofluoromethane	J4J5
	Vinyl chloride	J4
	Acetone	J4
	Chloroethane	J4
	Chloromethane	J4
L168965-14	Dichlorodifluoromethane	J4
	1,2-Dichloroethane	J4
	1,2-Dichloropropane	J3
	Trichlorofluoromethane	J4
	Vinyl chloride	J4
	Acetone	J4
	Chloroethane	J4
	Chloromethane	J4
	Dichlorodifluoromethane	J4
	1,2-Dichloroethane	J4
L168965-15	1,2-Dichloropropane	J3
	Trichlorofluoromethane	J4
	Vinyl chloride	J4
	Acetone	J4
	Chloroethane	J4
	Chloromethane	J4
	Dichlorodifluoromethane	J4
	1,2-Dichloroethane	J4
	1,2-Dichloropropane	J3
	Trichlorofluoromethane	J4

Attachment B
Explanation of QC Qualifier Codes

Qualifier	Meaning
J3	The associated batch QC was outside the established quality control range for precision.
J4	The associated batch QC was outside the established quality control range for accuracy.
J5	The sample matrix interfered with the ability to make any accurate determination; spike value is high
J6	The sample matrix interfered with the ability to make any accurate determination; spike value is low

Qualifier Report Information

ESC utilizes sample and result qualifiers as set forth by the EPA Contract Laboratory Program and as required by most certifying bodies including NELAC. In addition to the EPA qualifiers adopted by ESC, we have implemented ESC qualifiers to provide more information pertaining to our analytical results. Each qualifier is designated in the qualifier explanation as either EPA or ESC. Data qualifiers are intended to provide the ESC client with more detailed information concerning the potential bias of reported data. Because of the wide range of constituents and variety of matrices incorporated by most EPA methods, it is common for some compounds to fall outside of established ranges. These exceptions are evaluated and all reported data is valid and useable unless qualified as 'R' (Rejected).

Definitions

Accuracy - The relationship of the observed value of a known sample to the true value of a known sample. Represented by percent recovery and relevant to samples such as: control samples, matrix spike recoveries, surrogate recoveries, etc.

Precision - The agreement between a set of samples or between duplicate samples. Relates to how close together the results are and is represented by Relative Percent Difference.

Surrogate - Organic compounds that are similar in chemical composition, extraction, and chromatography to analytes of interest. The surrogates are used to determine the probable response of the group of analytes that are chemically related to the surrogate compound. Surrogates are added to the sample and carried through all stages of preparation and analyses.

		Control Limits		(AQ)	(SS)
2-Fluorophenol	31-119	Nitrobenzene-d5	43-118	Dibromfluoromethane	79-126 83-119
Phenol-d5	12-134	2-Fluorobiphenyl	45-128	Toluene-d8	81-114 82-116
2,4,6-Tribromophenol	51-141	Terphenyl-d14	43-137	4-Bromofluorobenzene	65-129 72-126

TIC - Tentatively Identified Compound: Compounds detected in samples that are not target compounds, internal standards, system monitoring compounds, or surrogates.

Summary of Remarks For Samples Printed
09/22/04 at 07:55:45

TSR Signing Reports: 690
R5 - Desired TAT

Sample: L168965-01 Account: DEFFIND Received: 09/09/04 11:00 Due Date: 09/16/04 00:00 RPT Date: 09/20/04 16:50
QC4 - Diss Metals
Sample: L168965-02 Account: DEFFIND Received: 09/09/04 11:00 Due Date: 09/16/04 00:00 RPT Date: 09/20/04 16:50
QC4 - Diss Metals
Sample: L168965-03 Account: DEFFIND Received: 09/09/04 11:00 Due Date: 09/16/04 00:00 RPT Date: 09/20/04 16:50
QC4 - Diss Metals
Sample: L168965-04 Account: DEFFIND Received: 09/09/04 11:00 Due Date: 09/16/04 00:00 RPT Date: 09/20/04 16:50
QC4 - Diss Metals
Sample: L168965-05 Account: DEFFIND Received: 09/09/04 11:00 Due Date: 09/16/04 00:00 RPT Date: 09/20/04 16:50
QC4 - Diss Metals
Sample: L168965-06 Account: DEFFIND Received: 09/09/04 11:00 Due Date: 09/16/04 00:00 RPT Date: 09/20/04 16:50
QC4-MS/MSD this sample-Diss Metals
Sample: L168965-07 Account: DEFFIND Received: 09/09/04 11:00 Due Date: 09/16/04 00:00 RPT Date: 09/20/04 16:50
QC4-Diss Metals
Sample: L168965-08 Account: DEFFIND Received: 09/09/04 11:00 Due Date: 09/16/04 00:00 RPT Date: 09/20/04 16:50
QC4-Diss Metals
Sample: L168965-09 Account: DEFFIND Received: 09/09/04 11:00 Due Date: 09/16/04 00:00 RPT Date: 09/20/04 16:50
QC4-Diss Metals
Sample: L168965-10 Account: DEFFIND Received: 09/09/04 11:00 Due Date: 09/16/04 00:00 RPT Date: 09/20/04 16:50
QC4-Diss Metals
Sample: L168965-11 Account: DEFFIND Received: 09/09/04 11:00 Due Date: 09/16/04 00:00 RPT Date: 09/20/04 16:50
QC4-Diss Metals
Sample: L168965-12 Account: DEFFIND Received: 09/09/04 11:00 Due Date: 09/16/04 00:00 RPT Date: 09/20/04 16:50
QC4-Diss Metals
Sample: L168965-13 Account: DEFFIND Received: 09/09/04 11:00 Due Date: 09/16/04 00:00 RPT Date: 09/20/04 16:50
QC4-Diss Metals
Sample: L168965-14 Account: DEFFIND Received: 09/09/04 11:00 Due Date: 09/16/04 00:00 RPT Date: 09/20/04 16:50
QC4-Diss Metals
Sample: L168965-15 Account: DEFFIND Received: 09/09/04 11:00 Due Date: 09/16/04 00:00 RPT Date: 09/20/04 16:50
QC4



ENVIRONMENTAL
SCIENCE CORP.

12065 Lebanon Rd.
Mt. Juliet, TN 37122
(615) 758-5858
1-800-767-5859
Fax (615) 758-5859

Tax I.D. 62-0814289

Est. 1970

REPORT OF ANALYSIS

Mr. Mick Cossairt
Deffenbaugh Industries
18181 W. 53rd
Shawnee, KS 66203

September 17, 2004

Date Received : September 09, 2004
Description : ISC Oxbow Surface Water Sediment
Sample ID : OX-1
Collected By :
Collection Date : 09/08/04 17:30

ESC Sample # : L168973-01

Site ID : OXBOW

Project # :

Parameter	Result	Det. Limit	Units	Method	Date	Dil.
Total Solids	70.4		%	2540G	09/16/04	1
Mercury	0.038	0.020	mg/kg	7471	09/14/04	1
Arsenic	4.2	0.50	mg/kg	6010B	09/16/04	1
Barium	110	0.25	mg/kg	6010B	09/16/04	1
Cadmium	0.30	0.25	mg/kg	6010B	09/16/04	1
Chromium	12.	0.50	mg/kg	6010B	09/16/04	1
Lead	40.	0.25	mg/kg	6010B	09/16/04	1
Manganese	310	0.50	mg/kg	6010B	09/16/04	1
Nickel	21.	0.50	mg/kg	6010B	09/16/04	1
Selenium	6.2	0.50	mg/kg	6010B	09/16/04	1
Silver	BDL	0.25	mg/kg	6010B	09/16/04	1
Volatile Organics						
Acetone	BDL	0.12	mg/kg	8260B	09/13/04	5
Acrolein	BDL	0.25	mg/kg	8260B	09/13/04	5
Acrylonitrile	BDL	0.050	mg/kg	8260B	09/13/04	5
Benzene	BDL	0.0050	mg/kg	8260B	09/13/04	5
Bromodichloromethane	BDL	0.0050	mg/kg	8260B	09/13/04	5
Bromoform	BDL	0.0050	mg/kg	8260B	09/13/04	5
Bromomethane	BDL	0.0050	mg/kg	8260B	09/13/04	5
Carbon disulfide	BDL	0.0050	mg/kg	8260B	09/13/04	5
Carbon tetrachloride	BDL	0.0050	mg/kg	8260B	09/13/04	5
Chlorobenzene	BDL	0.0050	mg/kg	8260B	09/13/04	5
Chlorodibromomethane	BDL	0.0050	mg/kg	8260B	09/13/04	5
Chloroethane	BDL	0.0050	mg/kg	8260B	09/13/04	5
Chloroform	BDL	0.025	mg/kg	8260B	09/13/04	5
Chloromethane	BDL	0.0050	mg/kg	8260B	09/13/04	5
1,2-Dibromoethane	BDL	0.0050	mg/kg	8260B	09/13/04	5
Dibromomethane	BDL	0.0050	mg/kg	8260B	09/13/04	5
1,2-Dibromo-3-Chloropropane	BDL	0.0050	mg/kg	8260B	09/13/04	5
1,2-Dichlorobenzene	BDL	0.0050	mg/kg	8260B	09/13/04	5
1,3-Dichlorobenzene	BDL	0.0050	mg/kg	8260B	09/13/04	5
1,4-Dichlorobenzene	BDL	0.0050	mg/kg	8260B	09/13/04	5
Dichlorodifluoromethane	BDL	0.0050	mg/kg	8260B	09/13/04	5
1,1-Dichloroethane	BDL	0.0050	mg/kg	8260B	09/13/04	5
1,2-Dichloroethane	BDL	0.0050	mg/kg	8260B	09/13/04	5

BDL - Below Detection Limit

Det. Limit - Estimated Quantitation Limit (EQL)

Laboratory Certification Numbers:

AIHA - 100789, AL - 40660, CA - I-2327, CT - PH-0197, FL - E87487, GA - 923, IN - C-TN-01
KY - 90010, KYUST - 0016, NC - ENV375, DW21704, ND - R-140, SC - 84004, TN - 2006, VA - 00109, WV - 233
MN - 047-999-395, NY - 11742



ENVIRONMENTAL SCIENCE CORP.

12065 Lebanon Rd.
Mt. Juliet, TN 37122
(615) 758-5858
1-800-767-5859
Fax (615) 758-5859

Tax I.D. 62-0814289

Est. 1970

REPORT OF ANALYSIS

September 17, 2004

Mr. Mick Cossairt
Deffenbaugh Industries
18181 W. 53rd
Shawnee, KS 66203

Date Received : September 09, 2004
Description : ISC Oxbow Surface Water / Sediment

Sample ID : OX-1

Collected By :
Collection Date : 09/08/04 17:30

ESC Sample # : L168973-01

Site ID : OXBOW

Project # :

Parameter	Result	Det. Limit	Units	Method	Date	Dil.
1,1-Dichloroethene	BDL	0.0050	mg/kg	8260B	09/13/04	5
cis-1,2-Dichloroethene	BDL	0.0050	mg/kg	8260B	09/13/04	5
trans-1,2-Dichloroethene	BDL	0.0050	mg/kg	8260B	09/13/04	5
1,2-Dichloropropane	BDL	0.0050	mg/kg	8260B	09/13/04	5
cis-1,3-Dichloropropene	BDL	0.0050	mg/kg	8260B	09/13/04	5
trans-1,3-Dichloropropene	BDL	0.0050	mg/kg	8260B	09/13/04	5
Ethylbenzene	BDL	0.0050	mg/kg	8260B	09/13/04	5
2-Hexanone	BDL	0.050	mg/kg	8260B	09/13/04	5
Iodomethane	BDL	0.050	mg/kg	8260B	09/13/04	5
2-Butanone (MEK)	BDL	0.050	mg/kg	8260B	09/13/04	5
Methylene Chloride	BDL	0.025	mg/kg	8260B	09/13/04	5
4-Methyl-2-pentanone (MIBK)	BDL	0.050	mg/kg	8260B	09/13/04	5
Pentachloroethane	BDL	0.025	mg/kg	8260B	09/13/04	5
Styrene	BDL	0.0050	mg/kg	8260B	09/13/04	5
1,1,1,2-Tetrachloroethane	BDL	0.0050	mg/kg	8260B	09/13/04	5
1,1,2,2-Tetrachloroethane	BDL	0.0050	mg/kg	8260B	09/13/04	5
Tetrachloroethene	BDL	0.0050	mg/kg	8260B	09/13/04	5
Toluene	BDL	0.025	mg/kg	8260B	09/13/04	5
1,1,1-Trichloroethane	BDL	0.0050	mg/kg	8260B	09/13/04	5
1,1,2-Trichloroethane	BDL	0.0050	mg/kg	8260B	09/13/04	5
Trichloroethene	BDL	0.0050	mg/kg	8260B	09/13/04	5
Trichlorofluoromethane	BDL	0.0050	mg/kg	8260B	09/13/04	5
1,2,3-Trichloropropane	BDL	0.0050	mg/kg	8260B	09/13/04	5
Vinyl acetate	BDL	0.050	mg/kg	8260B	09/13/04	5
Vinyl chloride	BDL	0.0050	mg/kg	8260B	09/13/04	5
Xylenes, Total	BDL	0.015	mg/kg	8260B	09/13/04	5
Acetonitrile	BDL	0.25	mg/kg	8260B	09/13/04	5
Allyl chloride	BDL	0.025	mg/kg	8260B	09/13/04	5
Chloroprene	BDL	0.25	mg/kg	8260B	09/13/04	5
trans-1,4-Dichloro-2-butene	BDL	0.012	mg/kg	8260B	09/13/04	5
Isobutanol	BDL	0.50	mg/kg	8260B	09/13/04	5
1,4-Dioxane	BDL	0.50	mg/kg	8260B	09/13/04	5
Methacrylonitrile	BDL	0.25	mg/kg	8260B	09/13/04	5
Methyl methacrylate	BDL	0.025	mg/kg	8260B	09/13/04	5
Ethyl methacrylate	BDL	0.025	mg/kg	8260B	09/13/04	5
Propionitrile	BDL	0.25	mg/kg	8260B	09/13/04	5
Surrogate Recovery						
Toluene-d8	98.		% Rec.	8260B	09/13/04	5

BDL - Below Detection Limit

Det. Limit - Estimated Quantitation Limit (EQL)

Laboratory Certification Numbers:

AIHA - 100789, AL - 40660, CA - I-2327, CT- PH-0197, FL - E87487, GA - 923, IN - C-TN-01
KY - 90010, KYUST - 0016, NC - ENV375, DW21704, ND - R-140, SC - 84004, TN - 2006, VA - 00109, WV - 233
MN - 047-999-395, NY - 11742



ENVIRONMENTAL
SCIENCE CORP.

12065 Lebanon Rd.
Mt. Juliet, TN 37122
(615) 758-5858
1-800-767-5859
Fax (615) 758-5859

Tax I.D. 62-0814289

Est. 1970

REPORT OF ANALYSIS

September 17, 2004

Mr. Mick Cossairt
Deffenbaugh Industries
18181 W. 53rd
Shawnee, KS 66203

Date Received : September 09, 2004
Description : ISC Oxbow Surface Water / Sediment
Sample ID : OX-1
Collected By :
Collection Date : 09/08/04 17:30

ESC Sample # : L168973-01

Site ID : OXBOW

Project # :

Parameter	Result	Det. Limit	Units	Method	Date	Dil.
Dibromofluoromethane	96.		% Rec.	8260B	09/13/04	5
4-Bromofluorobenzene	100		% Rec.	8260B	09/13/04	5

Tom Mellette, ESC Representative

BDL - Below Detection Limit

Det. Limit - Estimated Quantitation Limit (EQL)

Laboratory Certification Numbers:

AIHA - 100789, AL - 40660, CA - I-2327, CT- PH-0197, FL - E87487, GA - 923, IN - C-TN-01
KY - 90010, KYUST - 0016, NC - ENV375, DW21704, ND - R-140, SC - 84004, TN - 2006, VA - 00109, WV - 233
MN - 047-999-395, NY - 11742

Note:

The reported analytical results relate only to the sample submitted.
This report shall not be reproduced, except in full, without the written approval from ESC.

Reported: 09/17/04 08:24 Printed: 09/17/04 08:26



ENVIRONMENTAL SCIENCE CORP.

12065 Lebanon Rd.
Mt. Juliet, TN 37122
(615) 758-5858
1-800-767-5859
Fax (615) 758-5859

Tax I.D. 62-0814289

Est. 1970

REPORT OF ANALYSIS

September 17, 2004

Mr. Mick Cossairt
Deffenbaugh Industries
18181 W. 53rd
Shawnee, KS 66203

ESC Sample # : L168973-02

Date Received : September 09, 2004
Description : ISC Oxbow Surface Water / Sediment

Site ID : OXBOW

Sample ID : OX-2

Project # :

Collected By :
Collection Date : 09/08/04 17:10

Parameter	Result	Det. Limit	Units	Method	Date	Dil.
Total Solids	51.1		%	2540G	09/16/04	1
Mercury	0.023	0.020	mg/kg	7471	09/14/04	1
Arsenic	3.1	0.50	mg/kg	6010B	09/16/04	1
Barium	120	0.25	mg/kg	6010B	09/16/04	1
Cadmium	BDL	0.25	mg/kg	6010B	09/16/04	1
Chromium	10.	0.50	mg/kg	6010B	09/16/04	1
Lead	17.	0.25	mg/kg	6010B	09/16/04	1
Manganese	250	0.50	mg/kg	6010B	09/16/04	1
Nickel	19.	0.50	mg/kg	6010B	09/16/04	1
Selenium	5.1	0.50	mg/kg	6010B	09/16/04	1
Silver	BDL	0.25	mg/kg	6010B	09/16/04	1
Volatile Organics						
Acetone	BDL	0.12	mg/kg	8260B	09/13/04	5
Acrolein	BDL	0.25	mg/kg	8260B	09/13/04	5
Acrylonitrile	BDL	0.050	mg/kg	8260B	09/13/04	5
Benzene	BDL	0.0050	mg/kg	8260B	09/13/04	5
Bromodichloromethane	BDL	0.0050	mg/kg	8260B	09/13/04	5
Bromoform	BDL	0.0050	mg/kg	8260B	09/13/04	5
Bromomethane	BDL	0.0050	mg/kg	8260B	09/13/04	5
Carbon disulfide	BDL	0.0050	mg/kg	8260B	09/13/04	5
Carbon tetrachloride	BDL	0.0050	mg/kg	8260B	09/13/04	5
Chlorobenzene	BDL	0.0050	mg/kg	8260B	09/13/04	5
Chlorodibromomethane	BDL	0.0050	mg/kg	8260B	09/13/04	5
Chloroethane	BDL	0.0050	mg/kg	8260B	09/13/04	5
Chloroform	BDL	0.025	mg/kg	8260B	09/13/04	5
Chloromethane	BDL	0.0050	mg/kg	8260B	09/13/04	5
1,2-Dibromoethane	BDL	0.0050	mg/kg	8260B	09/13/04	5
Dibromomethane	BDL	0.0050	mg/kg	8260B	09/13/04	5
1,2-Dibromo-3-Chloropropane	BDL	0.0050	mg/kg	8260B	09/13/04	5
1,2-Dichlorobenzene	BDL	0.0050	mg/kg	8260B	09/13/04	5
1,3-Dichlorobenzene	BDL	0.0050	mg/kg	8260B	09/13/04	5
1,4-Dichlorobenzene	BDL	0.0050	mg/kg	8260B	09/13/04	5
Dichlorodifluoromethane	BDL	0.0050	mg/kg	8260B	09/13/04	5
1,1-Dichloroethane	BDL	0.0050	mg/kg	8260B	09/13/04	5
1,2-Dichloroethane	BDL	0.0050	mg/kg	8260B	09/13/04	5

BDL - Below Detection Limit

Det. Limit - Estimated Quantitation Limit (EQL)

Laboratory Certification Numbers:

AIHA - 100789, AL - 40660, CA - I-2327, CT- PH-0197, FL - E87487, GA - 923, IN - C-TN-01
KY - 90010, KYUST - 0016, NC - ENV375, DW21704, ND - R-140, SC - 84004, TN - 2006, VA - 00109, WV - 233
MN - 047-999-395, NY - 11742



ENVIRONMENTAL SCIENCE CORP.

12065 Lebanon Rd.
Mt. Juliet, TN 37122
(615) 758-5858
1-800-767-5859
Fax (615) 758-5859

Tax I.D. 62-0814289

Est. 1970

REPORT OF ANALYSIS

Mr. Mick Cossairt
Deffenbaugh Industries
18181 W. 53rd
Shawnee, KS 66203

September 17, 2004

Date Received : September 09, 2004
Description : ISC Oxbow Surface Water / Sediment
Sample ID : OX-2
Collected By :
Collection Date : 09/08/04 17:10

ESC Sample # : L168973-02

Site ID : OXBOW

Project # :

Parameter	Result	Det. Limit	Units	Method	Date	Dil.
1,1-Dichloroethene	BDL	0.0050	mg/kg	8260B	09/13/04	5
cis-1,2-Dichloroethene	BDL	0.0050	mg/kg	8260B	09/13/04	5
trans-1,2-Dichloroethene	BDL	0.0050	mg/kg	8260B	09/13/04	5
1,2-Dichloropropane	BDL	0.0050	mg/kg	8260B	09/13/04	5
cis-1,3-Dichloropropene	BDL	0.0050	mg/kg	8260B	09/13/04	5
trans-1,3-Dichloropropene	BDL	0.0050	mg/kg	8260B	09/13/04	5
Ethylbenzene	BDL	0.0050	mg/kg	8260B	09/13/04	5
2-Hexanone	BDL	0.050	mg/kg	8260B	09/13/04	5
Iodomethane	BDL	0.050	mg/kg	8260B	09/13/04	5
2-Butanone (MEK)	BDL	0.050	mg/kg	8260B	09/13/04	5
Methylene Chloride	BDL	0.025	mg/kg	8260B	09/13/04	5
4-Methyl-2-pentanone (MIBK)	BDL	0.050	mg/kg	8260B	09/13/04	5
Pentachloroethane	BDL	0.025	mg/kg	8260B	09/13/04	5
Styrene	BDL	0.0050	mg/kg	8260B	09/13/04	5
1,1,1,2-Tetrachloroethane	BDL	0.0050	mg/kg	8260B	09/13/04	5
1,1,2,2-Tetrachloroethane	BDL	0.0050	mg/kg	8260B	09/13/04	5
Tetrachloroethene	BDL	0.0050	mg/kg	8260B	09/13/04	5
Toluene	BDL	0.025	mg/kg	8260B	09/13/04	5
1,1,1-Trichloroethane	BDL	0.0050	mg/kg	8260B	09/13/04	5
1,1,2-Trichloroethane	BDL	0.0050	mg/kg	8260B	09/13/04	5
Trichloroethene	BDL	0.0050	mg/kg	8260B	09/13/04	5
Trichlorofluoromethane	BDL	0.0050	mg/kg	8260B	09/13/04	5
1,2,3-Trichloropropane	BDL	0.0050	mg/kg	8260B	09/13/04	5
Vinyl acetate	BDL	0.050	mg/kg	8260B	09/13/04	5
Vinyl chloride	BDL	0.0050	mg/kg	8260B	09/13/04	5
Xylenes, Total	BDL	0.015	mg/kg	8260B	09/13/04	5
Acetonitrile	BDL	0.25	mg/kg	8260B	09/13/04	5
Allyl chloride	BDL	0.025	mg/kg	8260B	09/13/04	5
Chloroprene	BDL	0.25	mg/kg	8260B	09/13/04	5
trans-1,4-Dichloro-2-butene	BDL	0.012	mg/kg	8260B	09/13/04	5
Isobutanol	BDL	0.50	mg/kg	8260B	09/13/04	5
1,4-Dioxane	BDL	0.50	mg/kg	8260B	09/13/04	5
Methacrylonitrile	BDL	0.25	mg/kg	8260B	09/13/04	5
Methyl methacrylate	BDL	0.025	mg/kg	8260B	09/13/04	5
Ethyl methacrylate	BDL	0.025	mg/kg	8260B	09/13/04	5
Propionitrile	BDL	0.25	mg/kg	8260B	09/13/04	5
Surrogate Recovery						
Toluene-d8	99.		% Rec.	8260B	09/13/04	5

BDL - Below Detection Limit

Det. Limit - Estimated Quantitation Limit (EQL)

Laboratory Certification Numbers:

AIHA - 100789, AL - 40660, CA - I-2327, CT- PH-0197, FL - E87487, GA - 923, IN - C-TN-01
KY - 90010, KYUST - 0016, NC - ENV375, DW21704, ND - R-140, SC - 84004, TN - 2006, VA - 00109, WV - 233
MN - 047-999-395, NY - 11742



ENVIRONMENTAL
SCIENCE CORP.

12065 Lebanon Rd.
Mt. Juliet, TN 37122
(615) 758-5858
1-800-767-5859
Fax (615) 758-5859

Tax I.D. 62-0814289

Est. 1970

REPORT OF ANALYSIS

Mr. Mick Cossairt
Deffenbaugh Industries
18181 W. 53rd
Shawnee, KS 66203

September 17, 2004

Date Received : September 09, 2004
Description : ISC Oxbow Surface Water / Sediment
Sample ID : OX-2
Collected By :
Collection Date : 09/08/04 17:10

ESC Sample # : L168973-02

Site ID : OXBOW

Project # :

Parameter	Result	Det. Limit	Units	Method	Date	Dil.
Dibromofluoromethane	96.		% Rec.	8260B	09/13/04	5
4-Bromofluorobenzene	97.		% Rec.	8260B	09/13/04	5

Tom Mellette, ESC Representative

BDL - Below Detection Limit

Det. Limit - Estimated Quantitation Limit (EQL)

Laboratory Certification Numbers:

AIHA - 100789, AL - 40660, CA - I-2327, CT- PH-0197, FL - E87487, GA - 923, IN - C-TN-01
KY - 90010, KYUST - 0016, NC - ENV375, DW21704, ND - R-140, SC - 84004, TN - 2006, VA - 00109, WV - 233
MN - 047-999-395, NY - 11742

Note:

The reported analytical results relate only to the sample submitted.

This report shall not be reproduced, except in full, without the written approval from ESC.

Reported: 09/17/04 08:24 Printed: 09/17/04 08:26



ENVIRONMENTAL SCIENCE CORP.

12065 Lebanon Rd.
Mt. Juliet, TN 37122
(615) 758-5858
1-800-767-5859
Fax (615) 758-5859

Tax I.D. 62-0814289

Est. 1970

REPORT OF ANALYSIS

September 17, 2004

Mr. Mick Cossairt
Deffenbaugh Industries
18181 W. 53rd
Shawnee, KS 66203

ESC Sample # : L168973-03

Date Received : September 09, 2004
Description : ISC Oxbow Surface Water / Sediment

Site ID : OXBOW

Sample ID : OX-3

Project # :

Collected By :
Collection Date : 09/08/04 16:15

Parameter	Result	Det. Limit	Units	Method	Date	Dil.
Total Solids	69.2		%	2540G	09/16/04	1
Mercury	0.034	0.020	mg/kg	7471	09/14/04	1
Arsenic	5.5	0.50	mg/kg	6010B	09/16/04	1
Barium	120	0.25	mg/kg	6010B	09/16/04	1
Cadmium	BDL	0.25	mg/kg	6010B	09/16/04	1
Chromium	15.	0.50	mg/kg	6010B	09/16/04	1
Lead	39.	0.25	mg/kg	6010B	09/16/04	1
Manganese	340	0.50	mg/kg	6010B	09/16/04	1
Nickel	27.	0.50	mg/kg	6010B	09/16/04	1
Selenium	7.4	0.50	mg/kg	6010B	09/16/04	1
Silver	BDL	0.25	mg/kg	6010B	09/16/04	1
Volatile Organics						
Acetone	BDL	0.12	mg/kg	8260B	09/13/04	5
Acrolein	BDL	0.25	mg/kg	8260B	09/13/04	5
Acrylonitrile	BDL	0.050	mg/kg	8260B	09/13/04	5
Benzene	BDL	0.0050	mg/kg	8260B	09/13/04	5
Bromodichloromethane	BDL	0.0050	mg/kg	8260B	09/13/04	5
Bromoform	BDL	0.0050	mg/kg	8260B	09/13/04	5
Bromomethane	BDL	0.0050	mg/kg	8260B	09/13/04	5
Carbon disulfide	BDL	0.0050	mg/kg	8260B	09/13/04	5
Carbon tetrachloride	BDL	0.0050	mg/kg	8260B	09/13/04	5
Chlorobenzene	BDL	0.0050	mg/kg	8260B	09/13/04	5
Chlorodibromomethane	BDL	0.0050	mg/kg	8260B	09/13/04	5
Chloroethane	BDL	0.0050	mg/kg	8260B	09/13/04	5
Chloroform	BDL	0.025	mg/kg	8260B	09/13/04	5
Chloromethane	BDL	0.0050	mg/kg	8260B	09/13/04	5
1,2-Dibromoethane	BDL	0.0050	mg/kg	8260B	09/13/04	5
Dibromomethane	BDL	0.0050	mg/kg	8260B	09/13/04	5
1,2-Dibromo-3-Chloropropane	BDL	0.0050	mg/kg	8260B	09/13/04	5
1,2-Dichlorobenzene	BDL	0.0050	mg/kg	8260B	09/13/04	5
1,3-Dichlorobenzene	BDL	0.0050	mg/kg	8260B	09/13/04	5
1,4-Dichlorobenzene	BDL	0.0050	mg/kg	8260B	09/13/04	5
Dichlorodifluoromethane	BDL	0.0050	mg/kg	8260B	09/13/04	5
1,1-Dichloroethane	BDL	0.0050	mg/kg	8260B	09/13/04	5
-1,2-Dichloroethane	BDL	0.0050	mg/kg	8260B	09/13/04	5

BDL - Below Detection Limit

Det. Limit - Estimated Quantitation Limit(EQL)

Laboratory Certification Numbers:

AIHA - 100789, AL - 40660, CA - I-2327, CT- PH-0197, FL - E87487, GA - 923, IN - C-TN-01
KY - 90010, KYUST - 0016, NC - ENV375, DW21704, ND - R-140, SC - 84004, TN - 2006, VA - 00109, WV - 233
MN - 047-999-395, NY - 11742



ENVIRONMENTAL SCIENCE CORP.

12065 Lebanon Rd.
Mt. Juliet, TN 37122
(615) 758-5858
1-800-767-5859
Fax (615) 758-5859

Tax I.D. 62-0814289

Est. 1970

REPORT OF ANALYSIS

Mr. Mick Cossairt
Deffenbaugh Industries
18181 W. 53rd
Shawnee, KS 66203

September 17, 2004

Date Received : September 09, 2004
Description : ISC Oxbow Surface Water / Sediment

ESC Sample # : L168973-03

Sample ID : OX-3

Site ID : OXBOW

Collected By :
Collection Date : 09/08/04 16:15

Project # :

Parameter	Result	Det. Limit	Units	Method	Date	Dil.
1,1-Dichloroethene	BDL	0.0050	mg/kg	8260B	09/13/04	5
cis-1,2-Dichloroethene	BDL	0.0050	mg/kg	8260B	09/13/04	5
trans-1,2-Dichloroethene	BDL	0.0050	mg/kg	8260B	09/13/04	5
1,2-Dichloropropane	BDL	0.0050	mg/kg	8260B	09/13/04	5
cis-1,3-Dichloropropene	BDL	0.0050	mg/kg	8260B	09/13/04	5
trans-1,3-Dichloropropene	BDL	0.0050	mg/kg	8260B	09/13/04	5
Ethylbenzene	BDL	0.0050	mg/kg	8260B	09/13/04	5
2-Hexanone	BDL	0.050	mg/kg	8260B	09/13/04	5
Iodomethane	BDL	0.050	mg/kg	8260B	09/13/04	5
2-Butanone (MEK)	BDL	0.050	mg/kg	8260B	09/13/04	5
Methylene Chloride	BDL	0.025	mg/kg	8260B	09/13/04	5
4-Methyl-2-pentanone (MIBK)	BDL	0.050	mg/kg	8260B	09/13/04	5
Pentachloroethane	BDL	0.025	mg/kg	8260B	09/13/04	5
Styrene	BDL	0.0050	mg/kg	8260B	09/13/04	5
1,1,1,2-Tetrachloroethane	BDL	0.0050	mg/kg	8260B	09/13/04	5
1,1,2,2-Tetrachloroethane	BDL	0.0050	mg/kg	8260B	09/13/04	5
Tetrachloroethene	BDL	0.0050	mg/kg	8260B	09/13/04	5
Toluene	BDL	0.025	mg/kg	8260B	09/13/04	5
1,1,1-Trichloroethane	BDL	0.0050	mg/kg	8260B	09/13/04	5
1,1,2-Trichloroethane	BDL	0.0050	mg/kg	8260B	09/13/04	5
Trichloroethene	BDL	0.0050	mg/kg	8260B	09/13/04	5
Trichlorofluoromethane	BDL	0.0050	mg/kg	8260B	09/13/04	5
1,2,3-Trichloropropane	BDL	0.0050	mg/kg	8260B	09/13/04	5
Vinyl acetate	BDL	0.050	mg/kg	8260B	09/13/04	5
Vinyl chloride	BDL	0.0050	mg/kg	8260B	09/13/04	5
Xylenes, Total	BDL	0.015	mg/kg	8260B	09/13/04	5
Acetonitrile	BDL	0.25	mg/kg	8260B	09/13/04	5
Allyl chloride	BDL	0.025	mg/kg	8260B	09/13/04	5
Chloroprene	BDL	0.25	mg/kg	8260B	09/13/04	5
trans-1,4-Dichloro-2-butene	BDL	0.012	mg/kg	8260B	09/13/04	5
Isobutanol	BDL	0.50	mg/kg	8260B	09/13/04	5
1,4-Dioxane	BDL	0.50	mg/kg	8260B	09/13/04	5
Methacrylonitrile	BDL	0.25	mg/kg	8260B	09/13/04	5
Methyl methacrylate	BDL	0.025	mg/kg	8260B	09/13/04	5
Ethyl methacrylate	BDL	0.025	mg/kg	8260B	09/13/04	5
Propionitrile	BDL	0.25	mg/kg	8260B	09/13/04	5
Surrogate Recovery	99.		% Rec.	-8260B	09/13/04	5
Toluene-d8						

BDL - Below Detection Limit

Det. Limit - Estimated Quantitation Limit (EQL)

Laboratory Certification Numbers:

AIHA - 100789, AL - 40660, CA - I-2327, CT- PH-0197, FL - E87487, GA - 923, IN - C-TN-01
KY - 90010, KYUST - 0016, NC - ENV375, DW21704, ND - R-140, SC - 84004, TN - 2006, VA - 00109, WV - 233
MN - 047-999-395, NY - 11742



ENVIRONMENTAL
SCIENCE CORP.

12065 Lebanon Rd.
Mt. Juliet, TN 37122
(615) 758-5858
1-800-767-5859
Fax (615) 758-5859

Tax I.D. 62-0814289

Est. 1970

REPORT OF ANALYSIS

Mr. Mick Cossairt
Deffenbaugh Industries
18181 W. 53rd
Shawnee, KS 66203

September 17, 2004

Date Received : September 09, 2004
Description : ISC Oxbow Surface Water / Sediment
Sample ID : OX-3
Collected By :
Collection Date : 09/08/04 16:15

ESC Sample # : L168973-03

Site ID : OXBOW

Project # :

Parameter	Result	Det. Limit	Units	Method	Date	Dil.
Dibromofluoromethane	96.		% Rec.	8260B	09/13/04	5
4-Bromofluorobenzene	100		% Rec.	8260B	09/13/04	5

Tom Mellette, ESC Representative

BDL - Below Detection Limit

Det. Limit - Estimated Quantitation Limit (EQL)

Laboratory Certification Numbers:

AIHA - 100789, AL - 40660, CA - I-2327, CT- PH-0197, FL - E87487, GA - 923, IN - C-TN-01
KY - 90010, KYUST - 0016, NC - ENV375, DW21704, ND - R-140, SC - 84004, TN - 2006, VA - 00109, WV - 233
MN - 047-999-395, NY - 11742

Note:

The reported analytical results relate only to the sample submitted.
This report shall not be reproduced, except in full, without the written approval from ESC.

Reported: 09/17/04 08:24 Printed: 09/17/04 08:26



ENVIRONMENTAL SCIENCE CORP.

12065 Lebanon Rd.
Mt. Juliet, TN 37122
(615) 758-5858
1-800-767-5859
Fax (615) 758-5859

Tax I.D. 62-0814289

Est. 1970

REPORT OF ANALYSIS

Mr. Mick Cossairt
Deffenbaugh Industries
18181 W. 53rd
Shawnee, KS 66203

September 17, 2004

Date Received : September 09, 2004
Description : ISC Oxbow Surface Water / Sediment
Sample ID : OX-4
Collected By :
Collection Date : 09/08/04 15:55

ESC Sample # : L168973-04

Site ID : OXBOW

Project # :

Parameter	Result	Det. Limit	Units	Method	Date	Dil.
Total Solids	73.2		%	2540G	09/16/04	1
Mercury	0.040	0.020	mg/kg	7471	09/14/04	1
Arsenic	3.6	0.50	mg/kg	6010B	09/16/04	1
Barium	110	0.25	mg/kg	6010B	09/16/04	1
Cadmium	0.31	0.25	mg/kg	6010B	09/16/04	1
Chromium	11.	0.50	mg/kg	6010B	09/16/04	1
Lead	30.	0.25	mg/kg	6010B	09/16/04	1
Manganese	200	0.50	mg/kg	6010B	09/16/04	1
Nickel	20.	0.50	mg/kg	6010B	09/16/04	1
Selenium	5.5	0.50	mg/kg	6010B	09/16/04	1
Silver	BDL	0.25	mg/kg	6010B	09/16/04	1
Volatile Organics						
Acetone	BDL	0.12	mg/kg	8260B	09/13/04	5
Acrolein	BDL	0.25	mg/kg	8260B	09/13/04	5
Acrylonitrile	BDL	0.050	mg/kg	8260B	09/13/04	5
Benzene	BDL	0.0050	mg/kg	8260B	09/13/04	5
Bromodichloromethane	BDL	0.0050	mg/kg	8260B	09/13/04	5
Bromoform	BDL	0.0050	mg/kg	8260B	09/13/04	5
Bromomethane	BDL	0.0050	mg/kg	8260B	09/13/04	5
Carbon disulfide	BDL	0.0050	mg/kg	8260B	09/13/04	5
Carbon tetrachloride	BDL	0.0050	mg/kg	8260B	09/13/04	5
Chlorobenzene	BDL	0.0050	mg/kg	8260B	09/13/04	5
Chlorodibromomethane	BDL	0.0050	mg/kg	8260B	09/13/04	5
Chloroethane	BDL	0.0050	mg/kg	8260B	09/13/04	5
Chloroform	BDL	0.025	mg/kg	8260B	09/13/04	5
Chloromethane	BDL	0.0050	mg/kg	8260B	09/13/04	5
1,2-Dibromoethane	BDL	0.0050	mg/kg	8260B	09/13/04	5
Dibromomethane	BDL	0.0050	mg/kg	8260B	09/13/04	5
1,2-Dibromo-3-Chloropropane	BDL	0.0050	mg/kg	8260B	09/13/04	5
1,2-Dichlorobenzene	BDL	0.0050	mg/kg	8260B	09/13/04	5
1,3-Dichlorobenzene	BDL	0.0050	mg/kg	8260B	09/13/04	5
1,4-Dichlorobenzene	BDL	0.0050	mg/kg	8260B	09/13/04	5
Dichlorodifluoromethane	BDL	0.0050	mg/kg	8260B	09/13/04	5
1,1-Dichloroethane	BDL	0.0050	mg/kg	8260B	09/13/04	5
1,2-Dichloroethane	BDL	0.0050	mg/kg	8260B	09/13/04	5

BDL - Below Detection Limit

Det. Limit - Estimated Quantitation Limit (EQL)

Laboratory Certification Numbers:

AIHA - 100789, AL - 40660, CA - I-2327, CT- PH-0197, FL - E87487, GA - 923, IN - C-TN-01
KY - 90010, KYUST - 0016, NC - ENV375, DW21704, ND - R-140, SC - 84004, TN - 2006, VA - 00109, WV - 233
MN - 047-999-395, NY - 11742



ENVIRONMENTAL SCIENCE CORP.

12065 Lebanon Rd.
Mt. Juliet, TN 37122
(615) 758-5858
1-800-767-5859
Fax (615) 758-5859

Tax I.D. 62-0814289

Est. 1970

REPORT OF ANALYSIS

Mr. Mick Cossairt
Deffenbaugh Industries
18181 W. 53rd
Shawnee, KS 66203

September 17, 2004

Date Received : September 09, 2004
Description : ISC Oxbow Surface Water / Sediment
Sample ID : OX-4
Collected By :
Collection Date : 09/08/04 15:55

ESC Sample # : L168973-04

Site ID : OXBOW

Project # :

Parameter	Result	Det. Limit	Units	Method	Date	Dil.
1,1-Dichloroethene	BDL	0.0050	mg/kg	8260B	09/13/04	5
cis-1,2-Dichloroethene	BDL	0.0050	mg/kg	8260B	09/13/04	5
trans-1,2-Dichloroethene	BDL	0.0050	mg/kg	8260B	09/13/04	5
1,2-Dichloropropane	BDL	0.0050	mg/kg	8260B	09/13/04	5
cis-1,3-Dichloropropene	BDL	0.0050	mg/kg	8260B	09/13/04	5
trans-1,3-Dichloropropene	BDL	0.0050	mg/kg	8260B	09/13/04	5
Ethylbenzene	BDL	0.0050	mg/kg	8260B	09/13/04	5
2-Hexanone	BDL	0.050	mg/kg	8260B	09/13/04	5
Iodomethane	BDL	0.050	mg/kg	8260B	09/13/04	5
2-Butanone (MEK)	BDL	0.050	mg/kg	8260B	09/13/04	5
Methylene Chloride	BDL	0.025	mg/kg	8260B	09/13/04	5
4-Methyl-2-pentanone (MIBK)	BDL	0.050	mg/kg	8260B	09/13/04	5
Pentachloroethane	BDL	0.025	mg/kg	8260B	09/13/04	5
Styrene	BDL	0.0050	mg/kg	8260B	09/13/04	5
1,1,1,2-Tetrachloroethane	BDL	0.0050	mg/kg	8260B	09/13/04	5
1,1,2,2-Tetrachloroethane	BDL	0.0050	mg/kg	8260B	09/13/04	5
Tetrachloroethene	BDL	0.0050	mg/kg	8260B	09/13/04	5
Toluene	BDL	0.025	mg/kg	8260B	09/13/04	5
1,1,1-Trichloroethane	BDL	0.0050	mg/kg	8260B	09/13/04	5
1,1,2-Trichloroethane	BDL	0.0050	mg/kg	8260B	09/13/04	5
Trichloroethene	BDL	0.0050	mg/kg	8260B	09/13/04	5
Trichlorofluoromethane	BDL	0.0050	mg/kg	8260B	09/13/04	5
1,2,3-Trichloropropane	BDL	0.0050	mg/kg	8260B	09/13/04	5
Vinyl acetate	BDL	0.050	mg/kg	8260B	09/13/04	5
Vinyl chloride	BDL	0.0050	mg/kg	8260B	09/13/04	5
Xylenes, Total	BDL	0.015	mg/kg	8260B	09/13/04	5
Acetonitrile	BDL	0.25	mg/kg	8260B	09/13/04	5
Allyl chloride	BDL	0.025	mg/kg	8260B	09/13/04	5
Chloroprene	BDL	0.25	mg/kg	8260B	09/13/04	5
trans-1,4-Dichloro-2-butene	BDL	0.012	mg/kg	8260B	09/13/04	5
Isobutanol	BDL	0.50	mg/kg	8260B	09/13/04	5
1,4-Dioxane	BDL	0.50	mg/kg	8260B	09/13/04	5
Methacrylonitrile	BDL	0.25	mg/kg	8260B	09/13/04	5
Methyl methacrylate	BDL	0.025	mg/kg	8260B	09/13/04	5
Ethyl methacrylate	BDL	0.025	mg/kg	8260B	09/13/04	5
Propionitrile	BDL	0.25	mg/kg	8260B	09/13/04	5
Surrogate Recovery						
Toluene-d8	99.		% Rec.	8260B	09/13/04	5

BDL - Below Detection Limit

Det. Limit - Estimated Quantitation Limit (EQL)

Laboratory Certification Numbers:

AIHA - 100789, AL - 40660, CA - I-2327, CT - PH-0197, FL - E87487, GA - 923, IN - C-TN-01
KY - 90010, KYUST - 0016, NC - ENV375, DW21704, ND - R-140, SC - 84004, TN - 2006, VA - 00109, WV - 233
MN - 047-999-395, NY - 11742



ENVIRONMENTAL
SCIENCE CORP.

12065 Lebanon Rd.
Mt. Juliet, TN 37122
(615) 758-5858
1-800-767-5859
Fax (615) 758-5859

Tax I.D. 62-0814289

Est. 1970

REPORT OF ANALYSIS

Mr. Mick Cossairt
Deffenbaugh Industries
18181 W. 53rd
Shawnee, KS 66203

September 17, 2004

Date Received : September 09, 2004
Description : ISC Oxbow Surface Water / Sediment
Sample ID : OX-4
Collected By :
Collection Date : 09/08/04 15:55

ESC Sample # : L168973-04

Site ID : OXBOW

Project # :

Parameter	Result	Det. Limit	Units	Method	Date	Dil.
Dibromofluoromethane	95.		% Rec.	8260B	09/13/04	5
4-Bromofluorobenzene	100		% Rec.	8260B	09/13/04	5

Tom Mellette, ESC Representative

BDL - Below Detection Limit

Det. Limit - Estimated Quantitation Limit (EQL)

Laboratory Certification Numbers:

AIHA - 100789, AL - 40660, CA - I-2327, CT- PH-0197, FL - E87487, GA - 923, IN - C-TN-01
KY - 90010, KYUST - 0016, NC - ENV375, DW21704, ND - R-140, SC - 84004, TN - 2006, VA - 00109, WV - 233
MN - 047-999-395, NY - 11742

Note:

The reported analytical results relate only to the sample submitted.

This report shall not be reproduced, except in full, without the written approval from ESC.

Reported: 09/17/04 08:24 Printed: 09/17/04 08:26



ENVIRONMENTAL SCIENCE CORP.

12065 Lebanon Rd.
Mt. Juliet, TN 37122
(615) 758-5858
1-800-767-5859
Fax (615) 758-5859

Tax I.D. 62-0814289

Est. 1970

REPORT OF ANALYSIS

Mr. Mick Cossairt
Deffenbaugh Industries
18181 W. 53rd
Shawnee, KS 66203

September 17, 2004

Date Received : September 09, 2004
Description : ISC Oxbow Surface Water / Sediment
Sample ID : OX-5
Collected By :
Collection Date : 09/08/04 14:40

ESC Sample # : L168973-05

Site ID : OXBOW

Project # :

Parameter	Result	Det. Limit	Units	Method	Date	Dil.
Total Solids	63.5		%	2540G	09/16/04	1
Mercury	0.11	0.020	mg/kg	7471	09/14/04	1
Arsenic	4.4	0.50	mg/kg	6010B	09/16/04	1
Barium	120	0.25	mg/kg	6010B	09/16/04	1
Cadmium	0.37	0.25	mg/kg	6010B	09/16/04	1
Chromium	14.	0.50	mg/kg	6010B	09/16/04	1
Lead	43.	0.25	mg/kg	6010B	09/16/04	1
Manganese	240	0.50	mg/kg	6010B	09/16/04	1
Nickel	24.	0.50	mg/kg	6010B	09/16/04	1
Selenium	6.2	0.50	mg/kg	6010B	09/16/04	1
Silver	BDL	0.25	mg/kg	6010B	09/16/04	1
Volatile Organics						
Acetone	BDL	0.12	mg/kg	8260B	09/13/04	5
Acrolein	BDL	0.25	mg/kg	8260B	09/13/04	5
Acrylonitrile	BDL	0.050	mg/kg	8260B	09/13/04	5
Benzene	BDL	0.0050	mg/kg	8260B	09/13/04	5
Bromodichloromethane	BDL	0.0050	mg/kg	8260B	09/13/04	5
Bromoform	BDL	0.0050	mg/kg	8260B	09/13/04	5
Bromomethane	BDL	0.0050	mg/kg	8260B	09/13/04	5
Carbon disulfide	BDL	0.0050	mg/kg	8260B	09/13/04	5
Carbon tetrachloride	BDL	0.0050	mg/kg	8260B	09/13/04	5
Chlorobenzene	BDL	0.0050	mg/kg	8260B	09/13/04	5
Chlorodibromomethane	BDL	0.0050	mg/kg	8260B	09/13/04	5
Chloroethane	BDL	0.0050	mg/kg	8260B	09/13/04	5
Chloroform	BDL	0.025	mg/kg	8260B	09/13/04	5
Chloromethane	BDL	0.0050	mg/kg	8260B	09/13/04	5
1,2-Dibromoethane	BDL	0.0050	mg/kg	8260B	09/13/04	5
Dibromomethane	BDL	0.0050	mg/kg	8260B	09/13/04	5
1,2-Dibromo-3-Chloropropane	BDL	0.0050	mg/kg	8260B	09/13/04	5
1,2-Dichlorobenzene	BDL	0.0050	mg/kg	8260B	09/13/04	5
1,3-Dichlorobenzene	BDL	0.0050	mg/kg	8260B	09/13/04	5
1,4-Dichlorobenzene	BDL	0.0050	mg/kg	8260B	09/13/04	5
Dichlorodifluoromethane	BDL	0.0050	mg/kg	8260B	09/13/04	5
1,1-Dichloroethane	BDL	0.0050	mg/kg	8260B	09/13/04	5
1,2-Dichloroethane	BDL	0.0050	mg/kg	8260B	09/13/04	5

BDL - Below Detection Limit

Det. Limit - Estimated Quantitation Limit (EQL)

Laboratory Certification Numbers:

AIHA - 100789, AL - 40660, CA - I-2327, CT- PH-0197, FL - E87487, GA - 923, IN - C-TN-01
KY - 90010, KYUST - 0016, NC - ENV375, DW21704, ND - R-140, SC - 84004, TN - 2006, VA - 00109, WV - 233
MN - 047-999-395, NY - 11742



ENVIRONMENTAL SCIENCE CORP.

12065 Lebanon Rd.
Mt. Juliet, TN 37122
(615) 758-5858
1-800-767-5859
Fax (615) 758-5859

Tax I.D. 62-0814289

Est. 1970

REPORT OF ANALYSIS

Mr. Mick Cossairt
Deffenbaugh Industries
18181 W. 53rd
Shawnee, KS 66203

September 17, 2004

Date Received : September 09, 2004
Description : ISC Oxbow Surface Water / Sediment

ESC Sample # : L168973-05

Sample ID : OX-5

Site ID : OXBOW

Collected By :
Collection Date : 09/08/04 14:40

Project # :

Parameter	Result	Det. Limit	Units	Method	Date	Dil.
1,1-Dichloroethene	BDL	0.0050	mg/kg	8260B	09/13/04	5
cis-1,2-Dichloroethene	BDL	0.0050	mg/kg	8260B	09/13/04	5
trans-1,2-Dichloroethene	BDL	0.0050	mg/kg	8260B	09/13/04	5
1,2-Dichloropropane	BDL	0.0050	mg/kg	8260B	09/13/04	5
cis-1,3-Dichloropropene	BDL	0.0050	mg/kg	8260B	09/13/04	5
trans-1,3-Dichloropropene	BDL	0.0050	mg/kg	8260B	09/13/04	5
Ethylbenzene	BDL	0.0050	mg/kg	8260B	09/13/04	5
2-Hexanone	BDL	0.050	mg/kg	8260B	09/13/04	5
Iodomethane	BDL	0.050	mg/kg	8260B	09/13/04	5
2-Butanone (MEK)	BDL	0.050	mg/kg	8260B	09/13/04	5
Methylene Chloride	BDL	0.025	mg/kg	8260B	09/13/04	5
4-Methyl-2-pentanone (MIBK)	BDL	0.050	mg/kg	8260B	09/13/04	5
Pentachloroethane	BDL	0.025	mg/kg	8260B	09/13/04	5
Styrene	BDL	0.0050	mg/kg	8260B	09/13/04	5
1,1,1,2-Tetrachloroethane	BDL	0.0050	mg/kg	8260B	09/13/04	5
1,1,2,2-Tetrachloroethane	BDL	0.0050	mg/kg	8260B	09/13/04	5
Tetrachloroethene	BDL	0.0050	mg/kg	8260B	09/13/04	5
Toluene	BDL	0.025	mg/kg	8260B	09/13/04	5
1,1,1-Trichloroethane	BDL	0.0050	mg/kg	8260B	09/13/04	5
1,1,2-Trichloroethane	BDL	0.0050	mg/kg	8260B	09/13/04	5
Trichloroethene	BDL	0.0050	mg/kg	8260B	09/13/04	5
Trichlorofluoromethane	BDL	0.0050	mg/kg	8260B	09/13/04	5
1,2,3-Trichloropropane	BDL	0.0050	mg/kg	8260B	09/13/04	5
Vinyl acetate	BDL	0.050	mg/kg	8260B	09/13/04	5
Vinyl chloride	BDL	0.0050	mg/kg	8260B	09/13/04	5
Xylenes, Total	BDL	0.015	mg/kg	8260B	09/13/04	5
Acetonitrile	BDL	0.25	mg/kg	8260B	09/13/04	5
Allyl chloride	BDL	0.025	mg/kg	8260B	09/13/04	5
Chloroprene	BDL	0.25	mg/kg	8260B	09/13/04	5
trans-1,4-Dichloro-2-butene	BDL	0.012	mg/kg	8260B	09/13/04	5
Isobutanol	BDL	0.50	mg/kg	8260B	09/13/04	5
1,4-Dioxane	BDL	0.50	mg/kg	8260B	09/13/04	5
Methacrylonitrile	BDL	0.25	mg/kg	8260B	09/13/04	5
Methyl methacrylate	BDL	0.025	mg/kg	8260B	09/13/04	5
Ethyl methacrylate	BDL	0.025	mg/kg	8260B	09/13/04	5
Propionitrile	BDL	0.25	mg/kg	8260B	09/13/04	5
Surrogate Recovery						
Toluene-d8	98.		% Rec.	8260B	09/13/04	5

BDL - Below Detection Limit

Det. Limit - Estimated Quantitation Limit (EQL)

Laboratory Certification Numbers:

AIHA - 100789, AL - 40660, CA - I-2327, CT- PH-0197, FL - E87487, GA - 923, IN - C-TN-01
KY - 90010, KYUST - 0016, NC - ENV375, DW21704, ND - R-140, SC - 84004, TN - 2006, VA - 00109, WV - 233
MN - 047-999-395, NY - 11742



ENVIRONMENTAL
SCIENCE CORP.

12065 Lebanon Rd.
Mt. Juliet, TN 37122
(615) 758-5858
1-800-767-5859
Fax (615) 758-5859

Tax I.D. 62-0814289

Est. 1970

REPORT OF ANALYSIS

September 17, 2004

Mr. Mick Cossairt
Deffenbaugh Industries
18181 W. 53rd
Shawnee, KS 66203

Date Received : September 09, 2004
Description : ISC Oxbow Surface Water / Sediment
Sample ID : OX-5
Collected By :
Collection Date : 09/08/04 14:40

ESC Sample # : L168973-05

Site ID : OXBOW

Project # :

Parameter	Result	Det. Limit	Units	Method	Date	Dil.
Dibromofluoromethane	97.		% Rec.	8260B	09/13/04	5
4-Bromofluorobenzene	100		% Rec.	8260B	09/13/04	5



Tom Mellette, ESC Representative

BDL - Below Detection Limit

Det. Limit - Estimated Quantitation Limit (EQL)

Laboratory Certification Numbers:

AIHA - 100789, AL - 40660, CA - I-2327, CT- PH-0197, FL - E87487, GA - 923, IN - C-TN-01
KY - 90010, KYUST - 0016, NC - ENV375, DW21704, ND - R-140, SC - 84004, TN - 2006, VA - 00109, WV - 233
MN - 047-999-395, NY - 11742

Note:

The reported analytical results relate only to the sample submitted.
This report shall not be reproduced, except in full, without the written approval from ESC.

Reported: 09/17/04 08:24 Printed: 09/17/04 08:26



ENVIRONMENTAL SCIENCE CORP.

12065 Lebanon Rd.
Mt. Juliet, TN 37122
(615) 758-5858
1-800-767-5859
Fax (615) 758-5859

Tax I.D. 62-0814289

Est. 1970

REPORT OF ANALYSIS

Mr. Mick Cossairt
Deffenbaugh Industries
18181 W. 53rd
Shawnee, KS 66203

September 17, 2004

Date Received : September 09, 2004
Description : ISC Oxbow Surface Water / Sediment

ESC Sample # : L168973-06

Sample ID : OX-6

Site ID : OXBOW

Collected By :
Collection Date : 09/08/04 12:30

Project # :

Parameter	Result	Det. Limit	Units	Method	Date	Dil.
Total Solids	70.3		%	2540G	09/16/04	1
Mercury	0.050	0.020	mg/kg	7471	09/14/04	1
Arsenic	4.3	0.50	mg/kg	6010B	09/16/04	1
Barium	120	0.25	mg/kg	6010B	09/16/04	1
Cadmium	0.44	0.25	mg/kg	6010B	09/16/04	1
Chromium	14.	0.50	mg/kg	6010B	09/16/04	1
Lead	44.	0.25	mg/kg	6010B	09/16/04	1
Manganese	270	0.50	mg/kg	6010B	09/16/04	1
Nickel	24.	0.50	mg/kg	6010B	09/16/04	1
Selenium	6.6	0.50	mg/kg	6010B	09/16/04	1
Silver	BDL	0.25	mg/kg	6010B	09/16/04	1
Volatile Organics						
Acetone	BDL	0.12	mg/kg	8260B	09/13/04	5
Acrolein	BDL	0.25	mg/kg	8260B	09/13/04	5
Acrylonitrile	BDL	0.050	mg/kg	8260B	09/13/04	5
Benzene	BDL	0.0050	mg/kg	8260B	09/13/04	5
Bromodichloromethane	BDL	0.0050	mg/kg	8260B	09/13/04	5
Bromoform	BDL	0.0050	mg/kg	8260B	09/13/04	5
Bromomethane	BDL	0.0050	mg/kg	8260B	09/13/04	5
Carbon disulfide	BDL	0.0050	mg/kg	8260B	09/13/04	5
Carbon tetrachloride	BDL	0.0050	mg/kg	8260B	09/13/04	5
Chlorobenzene	BDL	0.0050	mg/kg	8260B	09/13/04	5
Chlorodibromomethane	BDL	0.0050	mg/kg	8260B	09/13/04	5
Chloroethane	BDL	0.0050	mg/kg	8260B	09/13/04	5
Chloroform	BDL	0.025	mg/kg	8260B	09/13/04	5
Chloromethane	BDL	0.0050	mg/kg	8260B	09/13/04	5
1,2-Dibromoethane	BDL	0.0050	mg/kg	8260B	09/13/04	5
Dibromomethane	BDL	0.0050	mg/kg	8260B	09/13/04	5
1,2-Dibromo-3-Chloropropane	BDL	0.0050	mg/kg	8260B	09/13/04	5
1,2-Dichlorobenzene	BDL	0.0050	mg/kg	8260B	09/13/04	5
1,3-Dichlorobenzene	BDL	0.0050	mg/kg	8260B	09/13/04	5
1,4-Dichlorobenzene	BDL	0.0050	mg/kg	8260B	09/13/04	5
Dichlorodifluoromethane	BDL	0.0050	mg/kg	8260B	09/13/04	5
1,1-Dichloroethane	BDL	0.0050	mg/kg	8260B	09/13/04	5
1,2-Dichloroethane	BDL	0.0050	mg/kg	8260B	09/13/04	5

BDL - Below Detection Limit

Det. Limit - Estimated Quantitation Limit (EQL)

Laboratory Certification Numbers:

AIHA - 100789, AL - 40660, CA - I-2327, CT- PH-0197, FL - E87487, GA - 923, IN - C-TN-01
KY - 90010, KYUST - 0016, NC - ENV375, DW21704, ND - R-140, SC - 84004, TN - 2006, VA - 00109, WV - 233
MN - 047-999-395, NY - 11742



ENVIRONMENTAL SCIENCE CORP.

12065 Lebanon Rd.
Mt. Juliet, TN 37122
(615) 758-5858
1-800-767-5859
Fax (615) 758-5859

Tax I.D. 62-0814289

Est. 1970

REPORT OF ANALYSIS

Mr. Mick Cossairt
Deffenbaugh Industries
18181 W. 53rd
Shawnee, KS 66203

September 17, 2004

Date Received : September 09, 2004
Description : ISC Oxbow Surface Water / Sediment

ESC Sample # : L168973-06

Sample ID : OX-6

Site ID : OXBOW

Collected By :
Collection Date : 09/08/04 12:30

Project # :

Parameter	Result	Det. Limit	Units	Method	Date	Dil.
1,1-Dichloroethene	BDL	0.0050	mg/kg	8260B	09/13/04	5
cis-1,2-Dichloroethene	BDL	0.0050	mg/kg	8260B	09/13/04	5
trans-1,2-Dichloroethene	BDL	0.0050	mg/kg	8260B	09/13/04	5
1,2-Dichloropropane	BDL	0.0050	mg/kg	8260B	09/13/04	5
cis-1,3-Dichloropropene	BDL	0.0050	mg/kg	8260B	09/13/04	5
trans-1,3-Dichloropropene	BDL	0.0050	mg/kg	8260B	09/13/04	5
Ethylbenzene	BDL	0.0050	mg/kg	8260B	09/13/04	5
2-Hexanone	BDL	0.050	mg/kg	8260B	09/13/04	5
Iodomethane	BDL	0.050	mg/kg	8260B	09/13/04	5
2-Butanone (MEK)	BDL	0.050	mg/kg	8260B	09/13/04	5
Methylene Chloride	BDL	0.025	mg/kg	8260B	09/13/04	5
4-Methyl-2-pentanone (MIBK)	BDL	0.050	mg/kg	8260B	09/13/04	5
Pentachloroethane	BDL	0.025	mg/kg	8260B	09/13/04	5
Styrene	BDL	0.0050	mg/kg	8260B	09/13/04	5
1,1,1,2-Tetrachloroethane	BDL	0.0050	mg/kg	8260B	09/13/04	5
1,1,2,2-Tetrachloroethane	BDL	0.0050	mg/kg	8260B	09/13/04	5
Tetrachloroethene	BDL	0.0050	mg/kg	8260B	09/13/04	5
Toluene	BDL	0.025	mg/kg	8260B	09/13/04	5
1,1,1-Trichloroethane	BDL	0.0050	mg/kg	8260B	09/13/04	5
1,1,2-Trichloroethane	BDL	0.0050	mg/kg	8260B	09/13/04	5
Trichloroethene	BDL	0.0050	mg/kg	8260B	09/13/04	5
Trichlorofluoromethane	BDL	0.0050	mg/kg	8260B	09/13/04	5
1,2,3-Trichloropropane	BDL	0.0050	mg/kg	8260B	09/13/04	5
Vinyl acetate	BDL	0.050	mg/kg	8260B	09/13/04	5
Vinyl chloride	BDL	0.0050	mg/kg	8260B	09/13/04	5
Xylenes, Total	BDL	0.015	mg/kg	8260B	09/13/04	5
Acetonitrile	BDL	0.25	mg/kg	8260B	09/13/04	5
Allyl chloride	BDL	0.025	mg/kg	8260B	09/13/04	5
Chloroprene	BDL	0.25	mg/kg	8260B	09/13/04	5
trans-1,4-Dichloro-2-butene	BDL	0.012	mg/kg	8260B	09/13/04	5
Isobutanol	BDL	0.50	mg/kg	8260B	09/13/04	5
1,4-Dioxane	BDL	0.50	mg/kg	8260B	09/13/04	5
Methacrylonitrile	BDL	0.25	mg/kg	8260B	09/13/04	5
Methyl methacrylate	BDL	0.025	mg/kg	8260B	09/13/04	5
Ethyl methacrylate	BDL	0.025	mg/kg	8260B	09/13/04	5
Propionitrile	BDL	0.25	mg/kg	8260B	09/13/04	5
Surrogate Recovery						
Toluene-d8	98.		% Rec.	8260B	09/13/04	5

BDL - Below Detection Limit

Det. Limit - Estimated Quantitation Limit(EQL)

Laboratory Certification Numbers:

AIHA - 100789, AL - 40660, CA - I-2327, CT- PH-0197, FL - E87487, GA - 923, IN - C-TN-01
KY - 90010, KYUST - 0016, NC - ENV375, DW21704, ND - R-140, SC - 84004, TN - 2006, VA - 00109, WV - 233
MN - 047-999-395, NY - 11742



ENVIRONMENTAL
SCIENCE CORP.

12065 Lebanon Rd.
Mt. Juliet, TN 37122
(615) 758-5858
1-800-767-5859
Fax (615) 758-5859

Tax I.D. 62-0814289

Est. 1970

REPORT OF ANALYSIS

Mr. Mick Cossairt
Deffenbaugh Industries
18181 W. 53rd
Shawnee, KS 66203

September 17, 2004

Date Received : September 09, 2004
Description : ISC Oxbow Surface Water / Sediment
Sample ID : OX-6
Collected By :
Collection Date : 09/08/04 12:30

ESC Sample # : L168973-06

Site ID : OXBOW

Project # :

Parameter	Result	Det. Limit	Units	Method	Date	Dil.
Dibromofluoromethane	99.		% Rec.	8260B	09/13/04	5
4-Bromofluorobenzene	100		% Rec.	8260B	09/13/04	5

Tom Mellette, ESC Representative

BDL - Below Detection Limit

Det. Limit - Estimated Quantitation Limit (EQL)

Laboratory Certification Numbers:

AIHA - 100789, AL - 40660, CA - I-2327, CT- PH-0197, FL - E87487, GA - 923, IN - C-TN-01
KY - 90010, KYUST - 0016, NC - ENV375, DW21704, ND - R-140, SC - 84004, TN - 2006, VA - 00109, WV - 233
MN - 047-999-395, NY - 11742

Note:

The reported analytical results relate only to the sample submitted.

This report shall not be reproduced, except in full, without the written approval from ESC.

Reported: 09/17/04 08:24 Printed: 09/17/04 08:26



ENVIRONMENTAL SCIENCE CORP.

12065 Lebanon Rd.
Mt. Juliet, TN 37122
(615) 758-5858
1-800-767-5859
Fax (615) 758-5859

Tax I.D. 62-0814289

Est. 1970

REPORT OF ANALYSIS

September 17, 2004

Mr. Mick Cossairt
Deffenbaugh Industries
18181 W. 53rd
Shawnee, KS 66203

Date Received : September 09, 2004
Description : ISC Oxbow Surface Water / Sediment

Sample ID : OX-7

Collected By :
Collection Date : 09/08/04 16:30

ESC Sample # : L168973-07

Site ID : OXBOW

Project # :

Parameter	Result	Det. Limit	Units	Method	Date	Dil.
Total Solids	70.3		%	2540G	09/16/04	1
Mercury	0.036	0.020	mg/kg	7471	09/14/04	1
Arsenic	5.4	0.50	mg/kg	6010B	09/16/04	1
Barium	120	0.25	mg/kg	6010B	09/16/04	1
Cadmium	0.28	0.25	mg/kg	6010B	09/16/04	1
Chromium	13.	0.50	mg/kg	6010B	09/16/04	1
Lead	36.	0.25	mg/kg	6010B	09/16/04	1
Manganese	280	0.50	mg/kg	6010B	09/16/04	1
Nickel	24.	0.50	mg/kg	6010B	09/16/04	1
Selenium	7.1	0.50	mg/kg	6010B	09/16/04	1
Silver	BDL	0.25	mg/kg	6010B	09/16/04	1
Volatile Organics						
Acetone	BDL	0.12	mg/kg	8260B	09/13/04	5
Acrolein	BDL	0.25	mg/kg	8260B	09/13/04	5
Acrylonitrile	BDL	0.050	mg/kg	8260B	09/13/04	5
Benzene	BDL	0.0050	mg/kg	8260B	09/13/04	5
Bromodichloromethane	BDL	0.0050	mg/kg	8260B	09/13/04	5
Bromoform	BDL	0.0050	mg/kg	8260B	09/13/04	5
Bromomethane	BDL	0.0050	mg/kg	8260B	09/13/04	5
Carbon disulfide	BDL	0.0050	mg/kg	8260B	09/13/04	5
Carbon tetrachloride	BDL	0.0050	mg/kg	8260B	09/13/04	5
Chlorobenzene	BDL	0.0050	mg/kg	8260B	09/13/04	5
Chlorodibromomethane	BDL	0.0050	mg/kg	8260B	09/13/04	5
Chloroethane	BDL	0.0050	mg/kg	8260B	09/13/04	5
Chloroform	BDL	0.025	mg/kg	8260B	09/13/04	5
Chloromethane	BDL	0.0050	mg/kg	8260B	09/13/04	5
1,2-Dibromoethane	BDL	0.0050	mg/kg	8260B	09/13/04	5
Dibromomethane	BDL	0.0050	mg/kg	8260B	09/13/04	5
1,2-Dibromo-3-Chloropropane	BDL	0.0050	mg/kg	8260B	09/13/04	5
1,2-Dichlorobenzene	BDL	0.0050	mg/kg	8260B	09/13/04	5
1,3-Dichlorobenzene	BDL	0.0050	mg/kg	8260B	09/13/04	5
1,4-Dichlorobenzene	BDL	0.0050	mg/kg	8260B	09/13/04	5
Dichlorodifluoromethane	BDL	0.0050	mg/kg	8260B	09/13/04	5
1,1-Dichloroethane	BDL	0.0050	mg/kg	8260B	09/13/04	5
1,2-Dichloroethane	BDL	0.0050	mg/kg	8260B	09/13/04	5

BDL - Below Detection Limit

Det. Limit - Estimated Quantitation Limit (EQL)

Laboratory Certification Numbers:

AIHA - 100789, AL - 40660, CA - I-2327, CT - PH-0197, FL - E87487, GA - 923, IN - C-TN-01
KY - 90010, KYUST - 0016, NC - ENV375, DW21704, ND - R-140, SC - 84004, TN - 2006, VA - 00109, WV - 233
MN - 047-999-395, NY - 11742



ENVIRONMENTAL SCIENCE CORP.

12065 Lebanon Rd.
Mt. Juliet, TN 37122
(615) 758-5858
1-800-767-5859
Fax (615) 758-5859

Tax I.D. 62-0814289

Est. 1970

REPORT OF ANALYSIS

September 17, 2004

Mr. Mick Cossairt
Deffenbaugh Industries
18181 W. 53rd
Shawnee, KS 66203

Date Received : September 09, 2004
Description : ISC Oxbow Surface Water / Sediment
Sample ID : OX-7

ESC Sample # : L168973-07

Site ID : OXBOW

Collected By :
Collection Date : 09/08/04 16:30

Project # :

Parameter	Result	Det. Limit	Units	Method	Date	Dil.
1,1-Dichloroethene	BDL	0.0050	mg/kg	8260B	09/13/04	5
cis-1,2-Dichloroethene	BDL	0.0050	mg/kg	8260B	09/13/04	5
trans-1,2-Dichloroethene	BDL	0.0050	mg/kg	8260B	09/13/04	5
1,2-Dichloropropane	BDL	0.0050	mg/kg	8260B	09/13/04	5
cis-1,3-Dichloropropene	BDL	0.0050	mg/kg	8260B	09/13/04	5
trans-1,3-Dichloropropene	BDL	0.0050	mg/kg	8260B	09/13/04	5
Ethylbenzene	BDL	0.0050	mg/kg	8260B	09/13/04	5
2-Hexanone	BDL	0.050	mg/kg	8260B	09/13/04	5
Iodomethane	BDL	0.050	mg/kg	8260B	09/13/04	5
2-Butanone (MEK)	BDL	0.050	mg/kg	8260B	09/13/04	5
Methylene Chloride	BDL	0.025	mg/kg	8260B	09/13/04	5
4-Methyl-2-pentanone (MIBK)	BDL	0.050	mg/kg	8260B	09/13/04	5
Pentachloroethane	BDL	0.025	mg/kg	8260B	09/13/04	5
Styrene	BDL	0.0050	mg/kg	8260B	09/13/04	5
1,1,1,2-Tetrachloroethane	BDL	0.0050	mg/kg	8260B	09/13/04	5
1,1,2,2-Tetrachloroethane	BDL	0.0050	mg/kg	8260B	09/13/04	5
Tetrachloroethene	BDL	0.0050	mg/kg	8260B	09/13/04	5
Toluene	BDL	0.025	mg/kg	8260B	09/13/04	5
1,1,1-Trichloroethane	BDL	0.0050	mg/kg	8260B	09/13/04	5
1,1,2-Trichloroethane	BDL	0.0050	mg/kg	8260B	09/13/04	5
Trichloroethene	BDL	0.0050	mg/kg	8260B	09/13/04	5
Trichlorofluoromethane	BDL	0.0050	mg/kg	8260B	09/13/04	5
1,2,3-Trichloropropane	BDL	0.0050	mg/kg	8260B	09/13/04	5
Vinyl acetate	BDL	0.050	mg/kg	8260B	09/13/04	5
Vinyl chloride	BDL	0.0050	mg/kg	8260B	09/13/04	5
Xylenes, Total	BDL	0.015	mg/kg	8260B	09/13/04	5
Acetonitrile	BDL	0.25	mg/kg	8260B	09/13/04	5
Allyl chloride	BDL	0.025	mg/kg	8260B	09/13/04	5
Chloroprene	BDL	0.25	mg/kg	8260B	09/13/04	5
trans-1,4-Dichloro-2-butene	BDL	0.012	mg/kg	8260B	09/13/04	5
Isobutanol	BDL	0.50	mg/kg	8260B	09/13/04	5
1,4-Dioxane	BDL	0.50	mg/kg	8260B	09/13/04	5
Methacrylonitrile	BDL	0.25	mg/kg	8260B	09/13/04	5
Methyl methacrylate	BDL	0.025	mg/kg	8260B	09/13/04	5
Ethyl methacrylate	BDL	0.025	mg/kg	8260B	09/13/04	5
Propionitrile	BDL	0.25	mg/kg	8260B	09/13/04	5
Surrogate Recovery						
Toluene-d8	100		% Rec.	8260B	09/13/04	5

BDL - Below Detection Limit

Det. Limit - Estimated Quantitation Limit (EQL)

Laboratory Certification Numbers:

AIHA - 100789, AL - 40660, CA - I-2327, CT - PH-0197, FL - E87487, GA - 923, IN - C-TN-01
KY - 90010, KYUST - 0016, NC - ENV375, DW21704, ND - R-140, SC - 84004, TN - 2006, VA - 00109, WV - 233
MN - 047-999-395, NY - 11742



ENVIRONMENTAL
SCIENCE CORP.

12065 Lebanon Rd.
Mt. Juliet, TN 37122
(615) 758-5858
1-800-767-5859
Fax (615) 758-5859

Tax I.D. 62-0814289

Est. 1970

REPORT OF ANALYSIS

Mr. Mick Cossairt
Deffenbaugh Industries
18181 W. 53rd
Shawnee, KS 66203

September 17, 2004

Date Received : September 09, 2004
Description : ISC Oxbow Surface Water / Sediment
Sample ID : OX-7
Collected By :
Collection Date : 09/08/04 16:30

ESC Sample # : L168973-07

Site ID : OXBOW

Project # :

Parameter	Result	Det. Limit	Units	Method	Date	Dil.
Dibromofluoromethane	96.		% Rec.	8260B	09/13/04	5
4-Bromofluorobenzene	100		% Rec.	8260B	09/13/04	5

Tom Mellette, ESC Representative

BDL - Below Detection Limit

Det. Limit - Estimated Quantitation Limit (EQL)

Laboratory Certification Numbers:

AIHA - 100789, AL - 40660, CA - I-2327, CT- PH-0197, FL - E87487, GA - 923, IN - C-TN-01
KY - 90010, KYUST - 0016, NC - ENV375, DW21704, ND - R-140, SC - 84004, TN - 2006, VA - 00109, WV - 233
MN - 047-999-395, NY - 11742

Note:

The reported analytical results relate only to the sample submitted.
This report shall not be reproduced, except in full, without the written approval from ESC.

Reported: 09/17/04 08:24 Printed: 09/17/04 08:26



ENVIRONMENTAL
SCIENCE CORP.

12065 Lebanon Rd.
Mt. Juliet, TN 37122
(615) 758-5858
1-800-767-5859
Fax (615) 758-5859

Tax I.D. 62-0814289

Est. 1970

REPORT OF ANALYSIS

September 17, 2004

Mr. Mick Cossairt
Deffenbaugh Industries
18181 W. 53rd
Shawnee, KS 66203

Date Received : September 09, 2004
Description : ISC Oxbow Surface Water / Sediment
Sample ID : OX-8

ESC Sample # : L168973-08

Site ID : OXBOW

Project # :

Collected By :
Collection Date : 09/08/04 16:45

Parameter	Result	Det. Limit	Units	Method	Date	Dil.
Total Solids	74.0		%	2540G	09/16/04	1
Mercury	0.039	0.020	mg/kg	7471	09/14/04	1
Arsenic	5.3	0.50	mg/kg	6010B	09/16/04	1
Barium	120	0.25	mg/kg	6010B	09/16/04	1
Cadmium	0.30	0.25	mg/kg	6010B	09/16/04	1
Chromium	13.	0.50	mg/kg	6010B	09/16/04	1
Lead	34.	0.25	mg/kg	6010B	09/16/04	1
Manganese	270	0.50	mg/kg	6010B	09/16/04	1
Nickel	22.	0.50	mg/kg	6010B	09/16/04	1
Selenium	5.5	0.50	mg/kg	6010B	09/16/04	1
Silver	BDL	0.25	mg/kg	6010B	09/16/04	1
Volatile Organics						
Acetone	BDL	0.12	mg/kg	8260B	09/13/04	5
Acrolein	BDL	0.25	mg/kg	8260B	09/13/04	5
Acrylonitrile	BDL	0.050	mg/kg	8260B	09/13/04	5
Benzene	BDL	0.0050	mg/kg	8260B	09/13/04	5
Bromodichloromethane	BDL	0.0050	mg/kg	8260B	09/13/04	5
Bromoform	BDL	0.0050	mg/kg	8260B	09/13/04	5
Bromomethane	BDL	0.0050	mg/kg	8260B	09/13/04	5
Carbon disulfide	BDL	0.0050	mg/kg	8260B	09/13/04	5
Carbon tetrachloride	BDL	0.0050	mg/kg	8260B	09/13/04	5
Chlorobenzene	BDL	0.0050	mg/kg	8260B	09/13/04	5
Chlorodibromomethane	BDL	0.0050	mg/kg	8260B	09/13/04	5
Chloroethane	BDL	0.0050	mg/kg	8260B	09/13/04	5
Chloroform	BDL	0.025	mg/kg	8260B	09/13/04	5
Chloromethane	BDL	0.0050	mg/kg	8260B	09/13/04	5
1,2-Dibromoethane	BDL	0.0050	mg/kg	8260B	09/13/04	5
Dibromomethane	BDL	0.0050	mg/kg	8260B	09/13/04	5
1,2-Dibromo-3-Chloropropane	BDL	0.0050	mg/kg	8260B	09/13/04	5
1,2-Dichlorobenzene	BDL	0.0050	mg/kg	8260B	09/13/04	5
1,3-Dichlorobenzene	BDL	0.0050	mg/kg	8260B	09/13/04	5
1,4-Dichlorobenzene	BDL	0.0050	mg/kg	8260B	09/13/04	5
Dichlorodifluoromethane	BDL	0.0050	mg/kg	8260B	09/13/04	5
1,1-Dichloroethane	BDL	0.0050	mg/kg	8260B	09/13/04	5
1,2-Dichloroethane	BDL	0.0050	mg/kg	8260B	09/13/04	5

BDL - Below Detection Limit

Det. Limit - Estimated Quantitation Limit (EQL)

Laboratory Certification Numbers:

AIHA - 100789, AL - 40660, CA - I-2327, CT- PH-0197, FL - E87487, GA - 923, IN - C-TN-01
KY - 90010, KYUST - 0016, NC - ENV375, DW21704, ND - R-140, SC - 84004, TN - 2006, VA - 00109, WV - 233
MN - 047-999-395, NY - 11742



ENVIRONMENTAL SCIENCE CORP.

12065 Lebanon Rd.
Mt. Juliet, TN 37122
(615) 758-5858
1-800-767-5859
Fax (615) 758-5859

Tax I.D. 62-0814289

Est. 1970

REPORT OF ANALYSIS

Mr. Mick Cossairt
Deffenbaugh Industries
18181 W. 53rd
Shawnee, KS 66203

September 17, 2004

Date Received : September 09, 2004
Description : ISC Oxbow Surface Water / Sediment

ESC Sample # : L168973-08

Sample ID : OX-8

Site ID : OXBOW

Collected By :
Collection Date : 09/08/04 16:45

Project # :

Parameter	Result	Det. Limit	Units	Method	Date	Dil.
1,1-Dichloroethene	BDL	0.0050	mg/kg	8260B	09/13/04	5
cis-1,2-Dichloroethene	BDL	0.0050	mg/kg	8260B	09/13/04	5
trans-1,2-Dichloroethene	BDL	0.0050	mg/kg	8260B	09/13/04	5
1,2-Dichloropropane	BDL	0.0050	mg/kg	8260B	09/13/04	5
cis-1,3-Dichloropropene	BDL	0.0050	mg/kg	8260B	09/13/04	5
trans-1,3-Dichloropropene	BDL	0.0050	mg/kg	8260B	09/13/04	5
Ethylbenzene	BDL	0.0050	mg/kg	8260B	09/13/04	5
2-Hexanone	BDL	0.050	mg/kg	8260B	09/13/04	5
Iodomethane	BDL	0.050	mg/kg	8260B	09/13/04	5
2-Butanone (MEK)	BDL	0.050	mg/kg	8260B	09/13/04	5
Methylene Chloride	BDL	0.025	mg/kg	8260B	09/13/04	5
4-Methyl-2-pentanone (MIBK)	BDL	0.050	mg/kg	8260B	09/13/04	5
Pentachloroethane	BDL	0.025	mg/kg	8260B	09/13/04	5
Styrene	BDL	0.0050	mg/kg	8260B	09/13/04	5
1,1,1,2-Tetrachloroethane	BDL	0.0050	mg/kg	8260B	09/13/04	5
1,1,2,2-Tetrachloroethane	BDL	0.0050	mg/kg	8260B	09/13/04	5
Tetrachloroethene	BDL	0.0050	mg/kg	8260B	09/13/04	5
Toluene	BDL	0.025	mg/kg	8260B	09/13/04	5
1,1,1-Trichloroethane	BDL	0.0050	mg/kg	8260B	09/13/04	5
1,1,2-Trichloroethane	BDL	0.0050	mg/kg	8260B	09/13/04	5
Trichloroethene	BDL	0.0050	mg/kg	8260B	09/13/04	5
Trichlorofluoromethane	BDL	0.0050	mg/kg	8260B	09/13/04	5
1,2,3-Trichloropropane	BDL	0.0050	mg/kg	8260B	09/13/04	5
Vinyl acetate	BDL	0.050	mg/kg	8260B	09/13/04	5
Vinyl chloride	BDL	0.0050	mg/kg	8260B	09/13/04	5
Xylenes, Total	BDL	0.015	mg/kg	8260B	09/13/04	5
Acetonitrile	BDL	0.25	mg/kg	8260B	09/13/04	5
Allyl chloride	BDL	0.025	mg/kg	8260B	09/13/04	5
Chloroprene	BDL	0.25	mg/kg	8260B	09/13/04	5
trans-1,4-Dichloro-2-butene	BDL	0.012	mg/kg	8260B	09/13/04	5
Isobutanol	BDL	0.50	mg/kg	8260B	09/13/04	5
1,4-Dioxane	BDL	0.50	mg/kg	8260B	09/13/04	5
Methacrylonitrile	BDL	0.25	mg/kg	8260B	09/13/04	5
Methyl methacrylate	BDL	0.025	mg/kg	8260B	09/13/04	5
Ethyl methacrylate	BDL	0.025	mg/kg	8260B	09/13/04	5
Propionitrile	BDL	0.25	mg/kg	8260B	09/13/04	5
Surrogate Recovery						
Toluene-d8	100		% Rec.	8260B	09/13/04	5

BDL - Below Detection Limit

Det. Limit - Estimated Quantitation Limit (EQL)

Laboratory Certification Numbers:

AIHA - 100789, AL - 40660, CA - I-2327, CT - PH-0197, FL - E87487, GA - 923, IN - C-TN-01
KY - 90010, KYUST - 0016, NC - ENV375, DW21704, ND - R-140, SC - 84004, TN - 2006, VA - 00109, WV - 233
MN - 047-999-395, NY - 11742



ENVIRONMENTAL
SCIENCE CORP.

12065 Lebanon Rd.
Mt. Juliet, TN 37122
(615) 758-5858
1-800-767-5859
Fax (615) 758-5859

Tax I.D. 62-0814289

Est. 1970

REPORT OF ANALYSIS

September 17, 2004

Mr. Mick Cossairt
Deffenbaugh Industries
18181 W. 53rd
Shawnee, KS 66203

Date Received : September 09, 2004
Description : ISC Oxbow Surface Water / Sediment
Sample ID : OX-8
Collected By :
Collection Date : 09/08/04 16:45

ESC Sample # : L168973-08

Site ID : OXBOW

Project # :

Parameter	Result	Det. Limit	Units	Method	Date	Dil.
Dibromofluoromethane	97.		% Rec.	8260B	09/13/04	5
4-Bromofluorobenzene	98.		% Rec.	8260B	09/13/04	5

Tom Mellette, ESC Representative

BDL - Below Detection Limit

Det. Limit - Estimated Quantitation Limit (EQL)

Laboratory Certification Numbers:

AIHA - 100789, AL - 40660, CA - I-2327, CT- PH-0197, FL - E87487, GA - 923, IN - C-TN-01
KY - 90010, KYUST - 0016, NC - ENV375, DW21704, ND - R-140, SC - 84004, TN - 2006, VA - 00109, WV - 233
MN - 047-999-395, NY - 11742

Note:

The reported analytical results relate only to the sample submitted.

This report shall not be reproduced, except in full, without the written approval from ESC.

Reported: 09/17/04 08:24 Printed: 09/17/04 08:26



ENVIRONMENTAL SCIENCE CORP.

12065 Lebanon Rd.
Mt. Juliet, TN 37122
(615) 758-5858
1-800-767-5859
Fax (615) 758-5859

Tax I.D. 62-0814289

Est. 1970

REPORT OF ANALYSIS

Mr. Mick Cossairt
Deffenbaugh Industries
18181 W. 53rd
Shawnee, KS 66203

September 17, 2004

Date Received : September 09, 2004
Description : ISC Oxbow Surface Water / Sediment
Sample ID : OX-9
Collected By :
Collection Date : 09/08/04 15:55

ESC Sample # : L168973-09

Site ID : OXBOW

Project # :

Parameter	Result	Det. Limit	Units	Method	Date	Dil.
Total Solids	73.5		%	2540G	09/16/04	1
Mercury	0.035	0.020	mg/kg	7471	09/14/04	1
Arsenic	4.4	0.50	mg/kg	6010B	09/16/04	1
Barium	130	0.25	mg/kg	6010B	09/16/04	1
Cadmium	0.33	0.25	mg/kg	6010B	09/16/04	1
Chromium	12.	0.50	mg/kg	6010B	09/16/04	1
Lead	51.	0.25	mg/kg	6010B	09/16/04	1
Manganese	240	0.50	mg/kg	6010B	09/16/04	1
Nickel	20.	0.50	mg/kg	6010B	09/16/04	1
Selenium	5.6	0.50	mg/kg	6010B	09/16/04	1
Silver	BDL	0.25	mg/kg	6010B	09/16/04	1
Volatile Organics						
Acetone	BDL	0.12	mg/kg	8260B	09/14/04	5
Acrolein	BDL	0.25	mg/kg	8260B	09/14/04	5
Acrylonitrile	BDL	0.050	mg/kg	8260B	09/14/04	5
Benzene	BDL	0.0050	mg/kg	8260B	09/14/04	5
Bromodichloromethane	BDL	0.0050	mg/kg	8260B	09/14/04	5
Bromoform	BDL	0.0050	mg/kg	8260B	09/14/04	5
Bromomethane	BDL	0.0050	mg/kg	8260B	09/14/04	5
Carbon disulfide	BDL	0.0050	mg/kg	8260B	09/14/04	5
Carbon tetrachloride	BDL	0.0050	mg/kg	8260B	09/14/04	5
Chlorobenzene	BDL	0.0050	mg/kg	8260B	09/14/04	5
Chlorodibromomethane	BDL	0.0050	mg/kg	8260B	09/14/04	5
Chloroethane	BDL	0.0050	mg/kg	8260B	09/14/04	5
Chloroform	BDL	0.025	mg/kg	8260B	09/14/04	5
Chloromethane	BDL	0.0050	mg/kg	8260B	09/14/04	5
1,2-Dibromoethane	BDL	0.0050	mg/kg	8260B	09/14/04	5
Dibromomethane	BDL	0.0050	mg/kg	8260B	09/14/04	5
1,2-Dibromo-3-Chloropropane	BDL	0.0050	mg/kg	8260B	09/14/04	5
1,2-Dichlorobenzene	BDL	0.0050	mg/kg	8260B	09/14/04	5
1,3-Dichlorobenzene	BDL	0.0050	mg/kg	8260B	09/14/04	5
1,4-Dichlorobenzene	BDL	0.0050	mg/kg	8260B	09/14/04	5
Dichlorodifluoromethane	BDL	0.0050	mg/kg	8260B	09/14/04	5
1,1-Dichloroethane	BDL	0.0050	mg/kg	8260B	09/14/04	5
1,2-Dichloroethane	- BDL	0.0050	mg/kg	8260B	- 09/14/04	5

BDL - Below Detection Limit

Det. Limit - Estimated Quantitation Limit (EQL)

Laboratory Certification Numbers:

AIHA - 100789, AL - 40660, CA - I-2327, CT- PH-0197, FL - E87487, GA - 923, IN - C-TN-01
KY - 90010, KYUST - 0016, NC - ENV375, DW21704, ND - R-140, SC - 84004, TN - 2006, VA - 00109, WV - 233
MN - 047-999-395, NY - 11742



ENVIRONMENTAL SCIENCE CORP.

12065 Lebanon Rd.
Mt. Juliet, TN 37122
(615) 758-5858
1-800-767-5859
Fax (615) 758-5859

Tax I.D. 62-0814289

Est. 1970

REPORT OF ANALYSIS

Mr. Mick Cossairt
Deffenbaugh Industries
18181 W. 53rd
Shawnee, KS 66203

September 17, 2004

Date Received : September 09, 2004
Description : ISC Oxbow Surface Water / Sediment

ESC Sample # : L168973-09

Sample ID : OX-9

Site ID : OXBOW

Collected By :
Collection Date : 09/08/04 15:55

Project # :

Parameter	Result	Det. Limit	Units	Method	Date	Dil.
1,1-Dichloroethene	BDL	0.0050	mg/kg	8260B	09/14/04	5
cis-1,2-Dichloroethene	BDL	0.0050	mg/kg	8260B	09/14/04	5
trans-1,2-Dichloroethene	BDL	0.0050	mg/kg	8260B	09/14/04	5
1,2-Dichloropropane	BDL	0.0050	mg/kg	8260B	09/14/04	5
cis-1,3-Dichloropropene	BDL	0.0050	mg/kg	8260B	09/14/04	5
trans-1,3-Dichloropropene	BDL	0.0050	mg/kg	8260B	09/14/04	5
Ethylbenzene	BDL	0.0050	mg/kg	8260B	09/14/04	5
2-Hexanone	BDL	0.050	mg/kg	8260B	09/14/04	5
Iodomethane	BDL	0.050	mg/kg	8260B	09/14/04	5
2-Butanone (MEK)	BDL	0.050	mg/kg	8260B	09/14/04	5
Methylene Chloride	BDL	0.025	mg/kg	8260B	09/14/04	5
4-Methyl-2-pentanone (MIBK)	BDL	0.050	mg/kg	8260B	09/14/04	5
Pentachloroethane	BDL	0.025	mg/kg	8260B	09/14/04	5
Styrene	BDL	0.0050	mg/kg	8260B	09/14/04	5
1,1,1,2-Tetrachloroethane	BDL	0.0050	mg/kg	8260B	09/14/04	5
1,1,2,2-Tetrachloroethane	BDL	0.0050	mg/kg	8260B	09/14/04	5
Tetrachloroethene	BDL	0.0050	mg/kg	8260B	09/14/04	5
Toluene	BDL	0.025	mg/kg	8260B	09/14/04	5
1,1,1-Trichloroethane	BDL	0.0050	mg/kg	8260B	09/14/04	5
1,1,2-Trichloroethane	BDL	0.0050	mg/kg	8260B	09/14/04	5
Trichloroethene	BDL	0.0050	mg/kg	8260B	09/14/04	5
Trichlorofluoromethane	BDL	0.0050	mg/kg	8260B	09/14/04	5
1,2,3-Trichloropropane	BDL	0.0050	mg/kg	8260B	09/14/04	5
Vinyl acetate	BDL	0.050	mg/kg	8260B	09/14/04	5
Vinyl chloride	BDL	0.0050	mg/kg	8260B	09/14/04	5
Xylenes, Total	BDL	0.015	mg/kg	8260B	09/14/04	5
Acetonitrile	BDL	0.25	mg/kg	8260B	09/14/04	5
Allyl chloride	BDL	0.025	mg/kg	8260B	09/14/04	5
Chloroprene	BDL	0.25	mg/kg	8260B	09/14/04	5
trans-1,4-Dichloro-2-butene	BDL	0.012	mg/kg	8260B	09/14/04	5
Isobutanol	BDL	0.50	mg/kg	8260B	09/14/04	5
1,4-Dioxane	BDL	0.50	mg/kg	8260B	09/14/04	5
Methacrylonitrile	BDL	0.25	mg/kg	8260B	09/14/04	5
Methyl methacrylate	BDL	0.025	mg/kg	8260B	09/14/04	5
Ethyl methacrylate	BDL	0.025	mg/kg	8260B	09/14/04	5
Propionitrile	BDL	0.25	mg/kg	8260B	09/14/04	5
Surrogate Recovery						
Toluene-d8	99.		-% Rec.	8260B	09/14/04	5

BDL - Below Detection Limit

Det. Limit - Estimated Quantitation Limit (EQL)

Laboratory Certification Numbers:

AIHA - 100789, AL - 40660, CA - I-2327, CT- PH-0197, FL - E87487, GA - 923, IN - C-TN-01
KY - 90010, KYUST - 0016, NC - ENV375, DW21704, ND - R-140, SC - 84004, TN - 2006, VA - 00109, WV - 233
MN - 047-999-395, NY - 11742



ENVIRONMENTAL
SCIENCE CORP.

12065 Lebanon Rd.
Mt. Juliet, TN 37122
(615) 758-5858
1-800-767-5859
Fax (615) 758-5859

Tax I.D. 62-0814289

Est. 1970

REPORT OF ANALYSIS

September 17, 2004

Mr. Mick Cossairt
Deffenbaugh Industries
18181 W. 53rd
Shawnee, KS 66203

Date Received : September 09, 2004
Description : ISC Oxbow Surface Water / Sediment
Sample ID : OX-9
Collected By :
Collection Date : 09/08/04 15:55

ESC Sample # : L168973-09

Site ID : OXBOW

Project # :

Parameter	Result	Det. Limit	Units	Method	Date	Dil.
Dibromofluoromethane	99.		% Rec.	8260B	09/14/04	5
4-Bromofluorobenzene	97.		% Rec.	8260B	09/14/04	5

Tom Mellette, ESC Representative

BDL - Below Detection Limit

Det. Limit - Estimated Quantitation Limit (EQL)

Laboratory Certification Numbers:

AIHA - 100789, AL - 40660, CA - I-2327, CT- PH-0197, FL - E87487, GA - 923, IN - C-TN-01
KY - 90010, KYUST - 0016, NC - ENV375, DW21704, ND - R-140, SC - 84004, TN - 2006, VA - 00109, WV - 233
MN - 047-999-395, NY - 11742

Note:

The reported analytical results relate only to the sample submitted.

This report shall not be reproduced, except in full, without the written approval from ESC.

Reported: 09/17/04 08:24 Printed: 09/17/04 08:26



ENVIRONMENTAL SCIENCE CORP.

12065 Lebanon Rd.
Mt. Juliet, TN 37122
(615) 758-5858
1-800-767-5859
Fax (615) 758-5859

Tax I.D. 62-0814289

Est. 1970

REPORT OF ANALYSIS

September 17, 2004

Mr. Mick Cossairt
Deffenbaugh Industries
18181 W. 53rd
Shawnee, KS 66203

Date Received : September 09, 2004
Description : ISC Oxbow Surface Water / Sediment
Sample ID : OX-10
Collected By :
Collection Date : 09/08/04 14:55

ESC Sample # : L168973-10

Site ID : OXBOW

Project # :

Parameter	Result	Det. Limit	Units	Method	Date	Dil.
Total Solids	59.7		%	2540G	09/16/04	1
Mercury	0.035	0.020	mg/kg	7471	09/14/04	1
Arsenic	3.6	0.50	mg/kg	6010B	09/16/04	1
Barium	99.	0.25	mg/kg	6010B	09/16/04	1
Cadmium	0.32	0.25	mg/kg	6010B	09/16/04	1
Chromium	12.	0.50	mg/kg	6010B	09/16/04	1
Lead	37.	0.25	mg/kg	6010B	09/16/04	1
Manganese	230	0.50	mg/kg	6010B	09/16/04	1
Nickel	18.	0.50	mg/kg	6010B	09/16/04	1
Selenium	5.3	0.50	mg/kg	6010B	09/16/04	1
Silver	BDL	0.25	mg/kg	6010B	09/16/04	1
Volatile Organics						
Acetone	BDL	0.12	mg/kg	8260B	09/14/04	5
Acrolein	BDL	0.25	mg/kg	8260B	09/14/04	5
Acrylonitrile	BDL	0.050	mg/kg	8260B	09/14/04	5
Benzene	BDL	0.0050	mg/kg	8260B	09/14/04	5
Bromodichloromethane	BDL	0.0050	mg/kg	8260B	09/14/04	5
Bromoform	BDL	0.0050	mg/kg	8260B	09/14/04	5
Bromomethane	BDL	0.0050	mg/kg	8260B	09/14/04	5
Carbon disulfide	BDL	0.0050	mg/kg	8260B	09/14/04	5
Carbon tetrachloride	BDL	0.0050	mg/kg	8260B	09/14/04	5
Chlorobenzene	BDL	0.0050	mg/kg	8260B	09/14/04	5
Chlorodibromomethane	BDL	0.0050	mg/kg	8260B	09/14/04	5
Chloroethane	BDL	0.0050	mg/kg	8260B	09/14/04	5
Chloroform	BDL	0.025	mg/kg	8260B	09/14/04	5
Chloromethane	BDL	0.0050	mg/kg	8260B	09/14/04	5
1,2-Dibromoethane	BDL	0.0050	mg/kg	8260B	09/14/04	5
Dibromomethane	BDL	0.0050	mg/kg	8260B	09/14/04	5
1,2-Dibromo-3-Chloropropane	BDL	0.0050	mg/kg	8260B	09/14/04	5
1,2-Dichlorobenzene	BDL	0.0050	mg/kg	8260B	09/14/04	5
1,3-Dichlorobenzene	BDL	0.0050	mg/kg	8260B	09/14/04	5
1,4-Dichlorobenzene	BDL	0.0050	mg/kg	8260B	09/14/04	5
Dichlorodifluoromethane	BDL	0.0050	mg/kg	8260B	09/14/04	5
1,1-Dichloroethane	BDL	0.0050	mg/kg	8260B	09/14/04	5
1,2-Dichloroethane	BDL	0.0050	mg/kg	8260B	09/14/04	5

BDL - Below Detection Limit

Det. Limit - Estimated Quantitation Limit (EQL)

Laboratory Certification Numbers:

AIHA - 100789, AL - 40660, CA - I-2327, CT - PH-0197, FL - E87487, GA - 923, IN - C-TN-01
KY - 90010, KYUST - 0016, NC - ENV375, DW21704, ND - R-140, SC - 84004, TN - 2006, VA - 00109, WV - 233
MN - 047-999-395, NY - 11742



ENVIRONMENTAL SCIENCE CORP.

12065 Lebanon Rd.
Mt. Juliet, TN 37122
(615) 758-5858
1-800-767-5859
Fax (615) 758-5859

Tax I.D. 62-0814289

Est. 1970

REPORT OF ANALYSIS

Mr. Mick Cossairt
Deffenbaugh Industries
18181 W. 53rd
Shawnee, KS 66203

September 17, 2004

Date Received : September 09, 2004
Description : ISC Oxbow Surface Water / Sediment

ESC Sample # : L168973-10

Sample ID : OX-10

Site ID : OXBOW

Collected By :
Collection Date : 09/08/04 14:55

Project # :

Parameter	Result	Det. Limit	Units	Method	Date	Dil.
1,1-Dichloroethene	BDL	0.0050	mg/kg	8260B	09/14/04	5
cis-1,2-Dichloroethene	BDL	0.0050	mg/kg	8260B	09/14/04	5
trans-1,2-Dichloroethene	BDL	0.0050	mg/kg	8260B	09/14/04	5
1,2-Dichloropropane	BDL	0.0050	mg/kg	8260B	09/14/04	5
cis-1,3-Dichloropropene	BDL	0.0050	mg/kg	8260B	09/14/04	5
trans-1,3-Dichloropropene	BDL	0.0050	mg/kg	8260B	09/14/04	5
Ethylbenzene	BDL	0.0050	mg/kg	8260B	09/14/04	5
2-Hexanone	BDL	0.050	mg/kg	8260B	09/14/04	5
Iodomethane	BDL	0.050	mg/kg	8260B	09/14/04	5
2-Butanone (MEK)	BDL	0.050	mg/kg	8260B	09/14/04	5
Methylene Chloride	BDL	0.025	mg/kg	8260B	09/14/04	5
4-Methyl-2-pentanone (MIBK)	BDL	0.050	mg/kg	8260B	09/14/04	5
Pentachloroethane	BDL	0.025	mg/kg	8260B	09/14/04	5
Styrene	BDL	0.0050	mg/kg	8260B	09/14/04	5
1,1,1,2-Tetrachloroethane	BDL	0.0050	mg/kg	8260B	09/14/04	5
1,1,2,2-Tetrachloroethane	BDL	0.0050	mg/kg	8260B	09/14/04	5
Tetrachloroethene	BDL	0.0050	mg/kg	8260B	09/14/04	5
Toluene	BDL	0.025	mg/kg	8260B	09/14/04	5
1,1,1-Trichloroethane	BDL	0.0050	mg/kg	8260B	09/14/04	5
1,1,2-Trichloroethane	BDL	0.0050	mg/kg	8260B	09/14/04	5
Trichloroethene	BDL	0.0050	mg/kg	8260B	09/14/04	5
Trichlorofluoromethane	BDL	0.0050	mg/kg	8260B	09/14/04	5
1,2,3-Trichloropropane	BDL	0.0050	mg/kg	8260B	09/14/04	5
Vinyl acetate	BDL	0.050	mg/kg	8260B	09/14/04	5
Vinyl chloride	BDL	0.0050	mg/kg	8260B	09/14/04	5
Xylenes, Total	BDL	0.015	mg/kg	8260B	09/14/04	5
Acetonitrile	BDL	0.25	mg/kg	8260B	09/14/04	5
Allyl chloride	BDL	0.025	mg/kg	8260B	09/14/04	5
Chloroprene	BDL	0.25	mg/kg	8260B	09/14/04	5
trans-1,4-Dichloro-2-butene	BDL	0.012	mg/kg	8260B	09/14/04	5
Isobutanol	BDL	0.50	mg/kg	8260B	09/14/04	5
1,4-Dioxane	BDL	0.50	mg/kg	8260B	09/14/04	5
Methacrylonitrile	BDL	0.25	mg/kg	8260B	09/14/04	5
Methyl methacrylate	BDL	0.025	mg/kg	8260B	09/14/04	5
Ethyl methacrylate	BDL	0.025	mg/kg	8260B	09/14/04	5
Propionitrile	BDL	0.25	mg/kg	8260B	09/14/04	5
Surrogate Recovery						
Toluene-d8	100		% Rec.	8260B	09/14/04	5

BDL - Below Detection Limit

Det. Limit - Estimated Quantitation Limit (EQL)

Laboratory Certification Numbers:

AIHA - 100789, AL - 40660, CA - I-2327, CT- PH-0197, FL - E87487, GA - 923, IN - C-TN-01
KY - 90010, KYUST - 0016, NC - ENV375, DW21704, ND - R-140, SC - 84004, TN - 2006, VA - 00109, WV - 233
MN - 047-999-395, NY - 11742



ENVIRONMENTAL
SCIENCE CORP.

12065 Lebanon Rd.
Mt. Juliet, TN 37122
(615) 758-5858
1-800-767-5859
Fax (615) 758-5859

Tax I.D. 62-0814289

Est. 1970

REPORT OF ANALYSIS

Mr. Mick Cossairt
Deffenbaugh Industries
18181 W. 53rd
Shawnee, KS 66203

September 17, 2004

Date Received : September 09, 2004
Description : ISC Oxbow Surface Water / Sediment
Sample ID : OX-10
Collected By :
Collection Date : 09/08/04 14:55

ESC Sample # : L168973-10

Site ID : OXBOW

Project # :

Parameter	Result	Det. Limit	Units	Method	Date	Dil.
Dibromofluoromethane	96.		% Rec.	8260B	09/14/04	5
4-Bromofluorobenzene	99.		% Rec.	8260B	09/14/04	5

Tom Mellette, ESC Representative

BDL - Below Detection Limit

Det. Limit - Estimated Quantitation Limit (EQL)

Laboratory Certification Numbers:

AIHA - 100789, AL - 40660, CA - I-2327, CT- PH-0197, FL - E87487, GA - 923, IN - C-TN-01
KY - 90010, KYUST - 0016, NC - ENV375, DW21704, ND - R-140, SC - 84004, TN - 2006, VA - 00109, WV - 233
MN - 047-999-395, NY - 11742

Note:

The reported analytical results relate only to the sample submitted.

This report shall not be reproduced, except in full, without the written approval from ESC.

Reported: 09/17/04 08:24 Printed: 09/17/04 08:26



ENVIRONMENTAL
SCIENCE CORP.

12065 Lebanon Rd.
Mt. Juliet, TN 37122
(615) 758-5858
1-800-767-5859
Fax (615) 758-5859

Tax I.D. 62-0814289

Est. 1970

REPORT OF ANALYSIS

September 17, 2004

Mr. Mick Cossairt
Deffenbaugh Industries
18181 W. 53rd
Shawnee, KS 66203

Date Received : September 09, 2004
Description : ISC Oxbow Surface Water / Sediment
Sample ID : DUP
Collected By :
Collection Date : 09/08/04 12:30

ESC Sample # : L168973-11

Site ID : OXBOW

Project # :

Parameter	Result	Det. Limit	Units	Method	Date	Dil.
Total Solids	68.4		%	2540G	09/16/04	1
Mercury	0.050	0.020	mg/kg	7471	09/14/04	1
Arsenic	3.8	0.50	mg/kg	6010B	09/16/04	1
Barium	94.	0.25	mg/kg	6010B	09/16/04	1
Cadmium	0.46	0.25	mg/kg	6010B	09/16/04	1
Chromium	10.	0.50	mg/kg	6010B	09/16/04	1
Lead	44.	0.25	mg/kg	6010B	09/16/04	1
Manganese	220	0.50	mg/kg	6010B	09/16/04	1
Nickel	18.	0.50	mg/kg	6010B	09/16/04	1
Selenium	4.6	0.50	mg/kg	6010B	09/16/04	1
Silver	BDL	0.25	mg/kg	6010B	09/16/04	1
Volatile Organics						
Acetone	BDL	0.12	mg/kg	8260B	09/14/04	5
Acrolein	BDL	0.25	mg/kg	8260B	09/14/04	5
Acrylonitrile	BDL	0.050	mg/kg	8260B	09/14/04	5
Benzene	BDL	0.0050	mg/kg	8260B	09/14/04	5
Bromodichloromethane	BDL	0.0050	mg/kg	8260B	09/14/04	5
Bromoform	BDL	0.0050	mg/kg	8260B	09/14/04	5
Bromomethane	BDL	0.0050	mg/kg	8260B	09/14/04	5
Carbon disulfide	BDL	0.0050	mg/kg	8260B	09/14/04	5
Carbon tetrachloride	BDL	0.0050	mg/kg	8260B	09/14/04	5
Chlorobenzene	BDL	0.0050	mg/kg	8260B	09/14/04	5
Chlorodibromomethane	BDL	0.0050	mg/kg	8260B	09/14/04	5
Chloroethane	BDL	0.0050	mg/kg	8260B	09/14/04	5
Chloroform	BDL	0.025	mg/kg	8260B	09/14/04	5
Chloromethane	BDL	0.0050	mg/kg	8260B	09/14/04	5
1,2-Dibromoethane	BDL	0.0050	mg/kg	8260B	09/14/04	5
Dibromomethane	BDL	0.0050	mg/kg	8260B	09/14/04	5
1,2-Dibromo-3-Chloropropane	BDL	0.0050	mg/kg	8260B	09/14/04	5
1,2-Dichlorobenzene	BDL	0.0050	mg/kg	8260B	09/14/04	5
1,3-Dichlorobenzene	BDL	0.0050	mg/kg	8260B	09/14/04	5
1,4-Dichlorobenzene	BDL	0.0050	mg/kg	8260B	09/14/04	5
Dichlorodifluoromethane	BDL	0.0050	mg/kg	8260B	09/14/04	5
1,1-Dichloroethane	BDL	0.0050	mg/kg	8260B	09/14/04	5
1,2-Dichloroethane	BDL	0.0050	mg/kg	8260B	09/14/04	5

BDL - Below Detection Limit

Det. Limit - Estimated Quantitation Limit(EQL)

Laboratory Certification Numbers:

AIHA - 100789, AL - 40660, CA - I-2327, CT- PH-0197, FL - E87487, GA - 923, IN - C-TN-01
KY - 90010, KYUST - 0016, NC - ENV375, DW21704, ND - R-140, SC - 84004, TN - 2006, VA - 00109, WV - 233
MN - 047-999-395, NY - 11742



ENVIRONMENTAL
SCIENCE CORP.

12065 Lebanon Rd.
Mt. Juliet, TN 37122
(615) 758-5858
1-800-767-5859
Fax (615) 758-5859

Tax I.D. 62-0814289

Est. 1970

REPORT OF ANALYSIS

Mr. Mick Cossairt
Deffenbaugh Industries
18181 W. 53rd
Shawnee, KS 66203

September 17, 2004

Date Received : September 09, 2004
Description : ISC Oxbow Surface Water / Sediment
Sample ID : DUP
Collected By :
Collection Date : 09/08/04 12:30

ESC Sample # : L168973-11

Site ID : OXBOW

Project # :

Parameter	Result	Det. Limit	Units	Method	Date	Dil.
1,1-Dichloroethene	BDL	0.0050	mg/kg	8260B	09/14/04	5
cis-1,2-Dichloroethene	BDL	0.0050	mg/kg	8260B	09/14/04	5
trans-1,2-Dichloroethene	BDL	0.0050	mg/kg	8260B	09/14/04	5
1,2-Dichloropropane	BDL	0.0050	mg/kg	8260B	09/14/04	5
cis-1,3-Dichloropropene	BDL	0.0050	mg/kg	8260B	09/14/04	5
trans-1,3-Dichloropropene	BDL	0.0050	mg/kg	8260B	09/14/04	5
Ethylbenzene	BDL	0.0050	mg/kg	8260B	09/14/04	5
2-Hexanone	BDL	0.050	mg/kg	8260B	09/14/04	5
Iodomethane	BDL	0.050	mg/kg	8260B	09/14/04	5
2-Butanone (MEK)	BDL	0.050	mg/kg	8260B	09/14/04	5
Methylene Chloride	BDL	0.025	mg/kg	8260B	09/14/04	5
4-Methyl-2-pentanone (MIBK)	BDL	0.050	mg/kg	8260B	09/14/04	5
Pentachloroethane	BDL	0.025	mg/kg	8260B	09/14/04	5
Styrene	BDL	0.0050	mg/kg	8260B	09/14/04	5
1,1,1,2-Tetrachloroethane	BDL	0.0050	mg/kg	8260B	09/14/04	5
1,1,2,2-Tetrachloroethane	BDL	0.0050	mg/kg	8260B	09/14/04	5
Tetrachloroethene	BDL	0.0050	mg/kg	8260B	09/14/04	5
Toluene	BDL	0.025	mg/kg	8260B	09/14/04	5
1,1,1-Trichloroethane	BDL	0.0050	mg/kg	8260B	09/14/04	5
1,1,2-Trichloroethane	BDL	0.0050	mg/kg	8260B	09/14/04	5
Trichloroethene	BDL	0.0050	mg/kg	8260B	09/14/04	5
Trichlorofluoromethane	BDL	0.0050	mg/kg	8260B	09/14/04	5
1,2,3-Trichloropropane	BDL	0.0050	mg/kg	8260B	09/14/04	5
Vinyl acetate	BDL	0.050	mg/kg	8260B	09/14/04	5
Vinyl chloride	BDL	0.0050	mg/kg	8260B	09/14/04	5
Xylenes, Total	BDL	0.015	mg/kg	8260B	09/14/04	5
Acetonitrile	BDL	0.25	mg/kg	8260B	09/14/04	5
Allyl chloride	BDL	0.025	mg/kg	8260B	09/14/04	5
Chloroprene	BDL	0.25	mg/kg	8260B	09/14/04	5
trans-1,4-Dichloro-2-butene	BDL	0.012	mg/kg	8260B	09/14/04	5
Isobutanol	BDL	0.50	mg/kg	8260B	09/14/04	5
1,4-Dioxane	BDL	0.50	mg/kg	8260B	09/14/04	5
Methacrylonitrile	BDL	0.25	mg/kg	8260B	09/14/04	5
Methyl methacrylate	BDL	0.025	mg/kg	8260B	09/14/04	5
Ethyl methacrylate	BDL	0.025	mg/kg	8260B	09/14/04	5
Propionitrile	BDL	0.25	mg/kg	8260B	09/14/04	5
Surrogate Recovery						
Toluene-d8	97.		% Rec.	8260B	09/14/04	5

BDL - Below Detection Limit

Det. Limit - Estimated Quantitation Limit (EQL)

Laboratory Certification Numbers:

AIHA - 100789, AL - 40660, CA - I-2327, CT - PH-0197, FL - E87487, GA - 923, IN - C-TN-01
KY - 90010, KYUST - 0016, NC - ENV375, DW21704, ND - R-140, SC - 84004, TN - 2006, VA - 00109, WV - 233
MN - 047-999-395, NY - 11742



ENVIRONMENTAL
SCIENCE CORP.

12065 Lebanon Rd.
Mt. Juliet, TN 37122
(615) 758-5858
1-800-767-5859
Fax (615) 758-5859

Tax I.D. 62-0814289

Est. 1970

REPORT OF ANALYSIS

Mr. Mick Cossairt
Deffenbaugh Industries
18181 W. 53rd
Shawnee, KS 66203

September 17, 2004

Date Received : September 09, 2004
Description : ISC Oxbow Surface Water / Sediment
Sample ID : DUP
Collected By :
Collection Date : 09/08/04 12:30

ESC Sample # : L168973-11

Site ID : OXBOW

Project # :

Parameter	Result	Det. Limit	Units	Method	Date	Dil.
Dibromofluoromethane	99.		% Rec.	8260B	09/14/04	5
4-Bromofluorobenzene	97.		% Rec.	8260B	09/14/04	5

Tom Mellette, ESC Representative

BDL - Below Detection Limit

Det. Limit - Estimated Quantitation Limit (EQL)

Laboratory Certification Numbers:

AIHA - 100789, AL - 40660, CA - I-2327, CT- PH-0197, FL - E87487, GA - 923, IN - C-TN-01
KY - 90010, KYUST - 0016, NC - ENV375, DW21704, ND - R-140, SC - 84004, TN - 2006, VA - 00109, WV - 233
MN - 047-999-395, NY - 11742

Note:

The reported analytical results relate only to the sample submitted.

This report shall not be reproduced, except in full, without the written approval from ESC.

Reported: 09/17/04 08:24 Printed: 09/17/04 08:26

Attachment A
List of Analytes with QC Qualifiers

Sample #	Analyte	Qualifier
L168973-01	Acrolein	J6J3
	Dichlorodifluoromethane	J4J5
	Iodomethane	J4
	Vinyl acetate	J6
L168973-02	Dichlorodifluoromethane	J4
	Iodomethane	J4
L168973-03	Dichlorodifluoromethane	J4
	Iodomethane	J4
L168973-04	Dichlorodifluoromethane	J4
	Iodomethane	J4
L168973-05	Dichlorodifluoromethane	J4
	Iodomethane	J4
L168973-06	Chromium	J3
	Lead	J5
	Nickel	J3
	Selenium	J3J6
	Dichlorodifluoromethane	J4
	Iodomethane	J4
L168973-07	Dichlorodifluoromethane	J4
	Iodomethane	J4
L168973-08	Dichlorodifluoromethane	J4
	Iodomethane	J4
L168973-09	Dichlorodifluoromethane	J4
L168973-10	Dichlorodifluoromethane	J4
L168973-11	Dichlorodifluoromethane	J4

Attachment B
Explanation of QC Qualifier Codes

Qualifier	Meaning
J3	The associated batch QC was outside the established quality control range for precision.
J6	The sample matrix interfered with the ability to make any accurate determination; spike value is low
J4	The associated batch QC was outside the established quality control range for accuracy.
J5	The sample matrix interfered with the ability to make any accurate determination; spike value is high

Qualifier Report Information

ESC utilizes sample and result qualifiers as set forth by the EPA Contract Laboratory Program and as required by most certifying bodies including NELAC. In addition to the EPA qualifiers adopted by ESC, we have implemented ESC qualifiers to provide more information pertaining to our analytical results. Each qualifier is designated in the qualifier explanation as either EPA or ESC. Data qualifiers are intended to provide the ESC client with more detailed information concerning the potential bias of reported data. Because of the wide range of constituents and variety of matrices incorporated by most EPA methods, it is common for some compounds to fall outside of established ranges. These exceptions are evaluated and all reported data is valid and useable unless qualified as 'R' (Rejected).

Definitions

Accuracy - The relationship of the observed value of a known sample to the true value of a known sample. Represented by percent recovery and relevant to samples such as: control samples, matrix spike recoveries, surrogate recoveries, etc.

Precision - The agreement between a set of samples or between duplicate samples. Relates to how close together the results are and is represented by Relative Percent Difference.

Surrogate - Organic compounds that are similar in chemical composition, extraction, and chromatography to analytes of interest. The surrogates are used to determine the probable response of the group of analytes that are chemically related to the surrogate compound. Surrogates are added to the sample and carried through all stages of preparation and analyses.

			Control Limits		(AQ)	(SS)
2-Fluorophenol	31-119	Nitrobenzene-d5	43-118	Dibromofluoromethane	79-126	83-119
Phenol-d5	12-134	2-Fluorobiphenyl	45-128	Toluene-d8	81-114	82-116
2,4,6-Tribromophenol	51-141	Terphenyl-d14	43-137	4-Bromofluorobenzene	65-129	72-126

TIC - Tentatively Identified Compound: Compounds detected in samples that are not target compounds, internal standards, system monitoring compounds, or surrogates.

Summary of Remarks For Samples Printed
09/17/04 at 08:27:02

TSR Signing Reports: 690
R5 - Desired TAT

Sample: L168973-01 Account: DEFFIND Received: 09/09/04 11:00 Due Date: 09/16/04 00:00 RPT Date: 09/17/04 08:24
QC4
Sample: L168973-02 Account: DEFFIND Received: 09/09/04 11:00 Due Date: 09/16/04 00:00 RPT Date: 09/17/04 08:24
QC4
Sample: L168973-03 Account: DEFFIND Received: 09/09/04 11:00 Due Date: 09/16/04 00:00 RPT Date: 09/17/04 08:24
QC4
Sample: L168973-04 Account: DEFFIND Received: 09/09/04 11:00 Due Date: 09/16/04 00:00 RPT Date: 09/17/04 08:24
QC4
Sample: L168973-05 Account: DEFFIND Received: 09/09/04 11:00 Due Date: 09/16/04 00:00 RPT Date: 09/17/04 08:24
QC4
Sample: L168973-06 Account: DEFFIND Received: 09/09/04 11:00 Due Date: 09/16/04 00:00 RPT Date: 09/17/04 08:24
QC4-MS/MSD this sample-lf 9/9
Sample: L168973-07 Account: DEFFIND Received: 09/09/04 11:00 Due Date: 09/16/04 00:00 RPT Date: 09/17/04 08:24
QC4
Sample: L168973-08 Account: DEFFIND Received: 09/09/04 11:00 Due Date: 09/16/04 00:00 RPT Date: 09/17/04 08:24
QC4
Sample: L168973-09 Account: DEFFIND Received: 09/09/04 11:00 Due Date: 09/16/04 00:00 RPT Date: 09/17/04 08:24
QC4
Sample: L168973-10 Account: DEFFIND Received: 09/09/04 11:00 Due Date: 09/16/04 00:00 RPT Date: 09/17/04 08:24
QC4
Sample: L168973-11 Account: DEFFIND Received: 09/09/04 11:00 Due Date: 09/16/04 00:00 RPT Date: 09/17/04 08:24
QC4

APPENDIX
E

APPENDIX E

ProUCL Statistical Summaries for EPC Calculations

On-site/Off-site Area 1 Groundwater VOC COPCs

SAMPLE	Units	Benzene	cis-1,2-DCE	1,4-Dioxane	MTBE	TCE	VC
EPA-R-3	mg/l	0.0005	0.0005	0.05	0.0005	0.0005	0.0005
EPA-R-3	mg/l	0.0005	0.0005	0.05	0.0005	0.0005	0.0005
GW-1	mg/L	0.0005	0.0013	0.0022	0.0005	0.0005	0.0005
GW-1	mg/L	0.0011	0.001	0.05	0.0005	0.0005	0.0005
GW-1	mg/L	0.0005	0.0005	0.05	0.0005	0.0005	0.0005
GW-1	mg/l	0.0005	0.0012	0.0043	0.0005	0.0005	0.0005
GW-1	mg/l	0.0005	0.0005	0.05	0.0005	0.0005	0.0005
GW-5	mg/L	0.0005	0.0005	0.0038	0.0005	0.0005	0.0005
GW-5	mg/L	0.0005	0.0005	0.05	0.0005	0.0005	0.0005
GW-5	mg/L	0.0005	0.0005	0.05	0.0005	0.0005	0.0005
GW-5	mg/l	0.0005	0.0005	0.05	0.0005	0.0005	0.0005
GW-6A	mg/L	0.0005	0.0005	0.0022	0.0005	0.0005	0.0005
GW-6A	mg/l	0.0005	0.0005	0.0014	0.0005	0.0005	0.0005
GW-6B	mg/L	0.0005	0.036	0.82	0.015	0.012	0.0029
GW-6B	mg/L	0.0005	0.028	0.38	0.01	0.019	0.0022
GW-6B	mg/L	0.0005	0.013	0.05	0.0021	0.0005	0.0005
GW-6B	mg/L	0.0005	0.02	0.13	0.009	0.0063	0.0005
GW-6B	mg/L	0.0005	0.0013	0.05	0.0005	0.0005	0.0005
GW-6B	mg/l	0.0005	0.0052	0.11	0.0034	0.0011	0.0005
GW-6B	mg/l	0.0005	0.012	0.05	0.0072	0.0016	0.0005
GW-7	mg/L	0.0005	0.0005	0.0035	0.0005	0.0005	0.0005
GW-7	mg/L	0.0005	0.0005	0.05	0.0005	0.0005	0.0005
GW-7	mg/L	0.0005	0.0005	0.05	0.0005	0.0005	0.0005
GW-7	mg/l	0.0005	0.0005	0.0045	0.0005	0.0005	0.0005
GW-7	mg/l	0.0005	0.0005	0.05	0.0005	0.0005	0.0005
GW-11A	mg/L	0.0005	0.0005	0.025	0.0005	0.0005	0.0005
GW-11A	mg/L	0.0005	0.0005	0.0005	0.0005	0.0005	0.0005
GW-11A	mg/L	0.0005	0.0005	0.0047	0.0005	0.0005	0.0005
GW-11A	mg/L	0.0005	0.0005	0.05	0.0005	0.0005	0.0005
GW-11A	mg/L	0.0005	0.0005	0.05	0.0005	0.0005	0.0005
GW-11A	mg/l	0.0005	0.0005	0.0091	0.0023	0.0005	0.0005
GW-11A	mg/l	0.0005	0.0005	0.05	0.0005	0.0005	0.0005
GW-11B	mg/L	0.0005	0.0005	0.025	0.0049	0.0005	0.0005
GW-11B	mg/L	0.0005	0.0005	0.023	0.0049	0.0005	0.0005
GW-11B	mg/L	0.0005	0.0005	0.036	0.0026	0.0005	0.0005
GW-11B	mg/L	0.0005	0.0005	0.0042	0.0005	0.0005	0.0005
GW-11B	mg/L	0.0005	0.0005	0.026	0.0005	0.0005	0.0005
GW-11B	mg/l	0.0005	0.012	0.051	0.0083	0.0005	0.0005
GW-11B	mg/l	0.0005	0.0005	0.33	0.0005	0.0005	0.0005
GW-11C	mg/L	0.0005	0.084	2.8	0.0066	0.0026	0.11
GW-11C	mg/L	0.0005	0.062	1.7	0.0043	0.0011	0.088
GW-11C	mg/L	0.0005	0.19	1.2	0.011	0.0005	0.13
GW-11C	mg/L	0.0025	0.041	1.5	0.0077	0.0025	0.044
GW-11C	mg/L	0.001	0.11	1.3	0.0068	0.0005	0.086
GW-11C	mg/l	0.0016	0.19	1.6	0.01	0.0005	0.14
GW-11C	mg/l	0.0005	0.028	0.23	0.0026	0.0005	0.02
MDC		0.0016	0.19	2.8	0.015	0.019	0.14

Notes:

mg/L = milligrams/liter

MDC = maximum detected concentration

On-Site/Off-site Area 1 Groundwater Metals COCPs

SAMPLE LOCATION	Units	ARSENIC	CADMIUM	LEAD	MANGANESE
EPA-R-3	mg/l	0.013	0.0025	0.013	0.81
GW-1	mg/L	0.005	0.0025	0.0068	0.21
GW-1	mg/L	0.005	0.0025	0.0068	0.21
GW-1	mg/L	0.005	0.0025	0.0025	0.17
GW-1	mg/L	0.01	0.0025	0.018	0.31
GW-1	mg/l	0.01	0.0025	0.02	0.23
GW-1	mg/l	0.005	0.0025	0.007	0.13
GW-5	mg/L	0.005	0.0059	0.0068	0.093
GW-5	mg/L	0.005	0.0059	0.0068	0.093
GW-5	mg/L	0.005	0.0025	0.015	0.32
GW-5	mg/L	0.01	0.0086	0.045	0.39
GW-5	mg/l	0.0077	0.0025	0.018	0.21
GW-6A	mg/L	0.005	0.0025	0.021	0.27
GW-6A	mg/l	0.029	0.0089	0.045	1.5
GW-6B	mg/L	0.005	0.0025	0.003	0.17
GW-6B	mg/L	0.005	0.0025	0.0025	0.17
GW-6B	mg/L	0.019	0.0025	0.058	0.7
GW-6B	mg/L	0.01	0.0025	0.0025	0.43
GW-6B	mg/l	0.029	0.0089	0.0053	0.64
GW-6B	mg/l	0.022	0.0085	0.0025	0.69
GW-7	mg/L	0.005	0.011	0.016	2
GW-7	mg/L	0.005	0.011	0.016	2
GW-7	mg/L	0.005	0.0025	0.028	4.4
GW-7	mg/L	0.01	0.0025	0.031	3.4
GW-7	mg/l	0.0095	0.0025	0.019	6.4
GW-7	mg/l	0.0032	0.0025	0.0025	1.2
GW-11A	mg/L	0.012	0.0078	0.022	0.41
GW-11A	mg/L	0.012	0.0078	0.022	0.41
GW-11A	mg/L	0.005	0.0025	0.037	0.63
GW-11A	mg/L	0.01	0.014	0.059	1
GW-11A	mg/l	0.0038	0.0025	0.014	0.27
GW-11A	mg/l	0.0043	0.0025	0.0025	0.15
GW-11B	mg/L	0.026	0.0025	0.0025	0.310
GW-11B	mg/L	0.026	0.0025	0.0025	0.31
GW-11B	mg/L	0.022	0.0025	0.03	0.8
GW-11B	mg/L	0.01	0.0025	0.0087	0.35
GW-11B	mg/l	0.03	0.0025	0.0025	0.26
GW-11B	mg/l	0.028	0.0025	0.0025	0.24
GW-11C	mg/L	0.005	0.0025	0.0025	0.84
GW-11C	mg/L	0.005	0.0025	0.0025	0.84
GW-11C	mg/L	0.005	0.0025	0.0025	0.91
GW-11C	mg/L	0.01	0.0025	0.011	1.3
GW-11C	mg/l	0.021	0.0025	0.0025	0.97
GW-11C	mg/l	0.0018	0.0025	0.0025	0.89
MDC		0.03	0.014	0.059	6.4

Definitions:

mg/L = milligrams/liter

MDC = maximum detected concentration

General Statistics

Data File	GW Area 1		Variable: Benzene mg/L	
Raw Statistics		Normal Distribution Test		
Number of Valid Samples	46	Shapiro-Wilk Test Statistic		0.309365
Number of Unique Samples	5	Shapiro-Wilk 5% Critical Value		0.945
Minimum	0.0005	Data not normal at 5% significance level		
Maximum	0.0025			
Mean	0.000591	95% UCL (Assuming Normal Distribution)		
Median	0.0005	Student		0.000677
Standard Deviation	0.000348			
Variance	1.21E-07	Gamma Distribution Test		
Coefficient of Variation	0.587818	A-D Test Statistic		14.63747
Skewness	4.507886	A-D 5% Critical Value		0.751611
		K-S Test Statistic		0.52937
Gamma Statistics		K-S 5% Critical Value		0.13069
k hat	6.80772	Data do not follow gamma distribution		
k star (bias corrected)	6.378231	at 5% significance level		
Theta hat	8.69E-05			
Theta star	9.27E-05	95% UCLs (Assuming Gamma Distribution)		
nu hat	626.3102	Approximate Gamma UCL		0.000653
nu star	586.7972	Adjusted Gamma UCL		0.000655
Approx. Chi Square Value (.05)	531.5965			
Adjusted Level of Significance	0.044783	Lognormal Distribution Test		
Adjusted Chi Square Value	529.9032	Shapiro-Wilk Test Statistic		0.334306
		Shapiro-Wilk 5% Critical Value		0.945
Log-transformed Statistics		Data not lognormal at 5% significance level		
Minimum of log data	-7.600902			
Maximum of log data	-5.991465	95% UCLs (Assuming Lognormal Distribution)		
Mean of log data	-7.50842	95% H-UCL		0.000629
Standard Deviation of log data	0.32152	95% Chebyshev (MVUE) UCL		0.000699
Variance of log data	0.103375	97.5% Chebyshev (MVUE) UCL		0.000751
		99% Chebyshev (MVUE) UCL		0.000855
		95% Non-parametric UCLs		
		CLT UCL		0.000676
		Adj-CLT UCL (Adjusted for skewness)		0.000712
		Mod-t U		0.000683
		Jackknife UCL		0.000677
		Standard Bootstrap UCL		0.000675
		Bootstrap-t UCL		0.000899
RECOMMENDATION		Hall's Bootstrap UCL		0.00093
Data are Non-parametric (0.05)		Percentile Bootstrap UCL		0.00068
		BCA Bootstrap UCL		0.000722
Use Student's-t UCL		95% Chebyshev (Mean, Sd) UCL		0.000815
or Modified-t UCL		97.5% Chebyshev (Mean, Sd) UCL		0.000911
		99% Chebyshev (Mean, Sd) UCL		0.001101

General Statistics

Data File	GW Area 1		Variable: 1,4-Dioxar mg/L	
Raw Statistics		Normal Distribution Test		
Number of Valid Samples	46	Shapiro-Wilk Test Statistic	0.533143	
Number of Unique Samples	28	Shapiro-Wilk 5% Critical Value	0.945	
Minimum	0.0005	Data not normal at 5% significance level		
Maximum	2.8			
Mean	0.286443	95% UCL (Assuming Normal Distribution)		
Median	0.05	Student's-t UCL	0.433874	
Standard Deviation	0.595396			
Variance	0.354497	Gamma Distribution Test		
Coefficient of Variation	2.078582	A-D Test Statistic	3.509598	
Skewness	2.656215	A-D 5% Critical Value	0.845803	
		K-S Test Statistic	0.333151	
Gamma Statistics		K-S 5% Critical Value	0.140501	
k hat	0.366937	Data do not follow gamma distribution		
k star (bias corrected)	0.357499	at 5% significance level		
Theta hat	0.780633			
Theta star	0.801242	95% UCLs (Assuming Gamma Distribution)		
nu hat	33.75822	Approximate Gamma UCL	0.453441	
nu star	32.88993	Adjusted Gamma UCL	0.460368	
Approx.Chi Square Value (.05)	20.7769			
Adjusted Level of Significance	0.044783	Lognormal Distribution Test		
Adjusted Chi Square Value	20.46429	Shapiro-Wilk Test Statistic	0.927485	
		Shapiro-Wilk 5% Critical Value	0.945	
Log-transformed Statistics		Data not lognormal at 5% significance level		
Minimum of log data	-7.600902			
Maximum of log data	1.029619	95% UCLs (Assuming Lognormal Distribution)		
Mean of log data	-3.068749	95% H-UCL	1.142877	
Standard Deviation of log data	2.042955	95% Chebyshev (MVUE) UCL	0.96034	
Variance of log data	4.173665	97.5% Chebyshev (MVUE) UCL	1.232905	
		99% Chebyshev (MVUE) UCL	1.768305	
		95% Non-parametric UCLs		
		CLT UCL	0.430839	
		Adj-CLT UCL (Adjusted for skewness)	0.467575	
		Mod-t UCL (Adjusted for skewness)	0.439604	
		Jackknife UCL	0.433874	
		Standard Bootstrap UCL	0.431642	
		Bootstrap-t UCL	0.495136	
RECOMMENDATION		Hall's Bootstrap UCL	0.469643	
Data are Non-parametric (0.05)		Percentile Bootstrap UCL	0.423726	
		BCA Bootstrap UCL	0.464698	
Use 99% Chebyshev (Mean, Sd) UCL		95% Chebyshev (Mean, Sd) UCL	0.669096	
		97.5% Chebyshev (Mean, Sd) UCL	0.834669	
		99% Ch	1.159907	

General Statistics

Data File	GW Area 1		Variable: ARSENIC mg/L	
Raw Statistics		Normal Distribution Test		
Number of Valid Samples	44	Shapiro-Wilk Test Statistic		0.776335
Number of Unique Samples	17	Shapiro-Wilk 5% Critical Value		0.944
Minimum	0.0018	Data not normal at 5% significance level		
Maximum	0.03			
Mean	0.011007	95% UCL (Assuming Normal Distribution)		
Median	0.0086	Student's-t UCL		0.013136
Standard Deviation	0.008402			
Variance	7.06E-05	Gamma Distribution Test		
Coefficient of Variation	0.763323	A-D Test Statistic		2.58351
Skewness	1.177393	A-D 5% Critical Value		0.759683
		K-S Test Statistic		0.256764
Gamma Statistics		K-S 5% Critical Value		0.134912
k hat	2.111193	Data do not follow gamma distribution		
k star (bias corrected)	1.9824	at 5% significance level		
Theta hat	0.005214			
Theta star	0.005552	95% UCLs (Assuming Gamma Distribution)		
nu hat	185.785	Approximate Gamma UCL		0.013252
nu star	174.4512	Adjusted Gamma UCL		0.013336
Approx.Chi Square Value (.05)	144.8995			
Adjusted Level of Significance	0.044545	Lognormal Distribution Test		
Adjusted Chi Square Value	143.988	Shapiro-Wilk Test Statistic		0.889995
		Shapiro-Wilk 5% Critical Value		0.944
Log-transformed Statistics		Data not lognormal at 5% significance level		
Minimum of log data	-6.319969			
Maximum of log data	-3.506558	95% UCLs (Assuming Lognormal Distribution)		
Mean of log data	-4.764387	95% H-UCL		0.013725
Standard Deviation of log data	0.710584	95% Chebyshev (MVUE) UCL		0.016469
Variance of log data	0.50493	97.5% Chebyshev (MVUE) UCL		0.018879
		99% Chebyshev (MVUE) UCL		0.023612
		95% Non-parametric UCLs		
		CLT UCL		0.01309
		Adj-CLT UCL (Adjusted for skewness)		0.01333
		Mod-t UCL (Adjusted for skewness)		0.013174
		Jackknife UCL		0.013136
		Standard Bootstrap UCL		0.013081
		Bootstrap-t UCL		0.013395
RECOMMENDATION		Hall's Bootstrap UCL		0.013158
Data are Non-parametric (0.05)		Percentile Bootstrap UCL		0.013041
		BCA Bootstrap UCL		0.013139
Use 95% Chebyshev (Mean, Sd) UCL		95% Ch		0.016528
		97.5% Chebyshev (Mean, Sd) UCL		0.018917
		99% Chebyshev (Mean, Sd) UCL		0.023609

General Statistics

Data File:	Groundwater Area 1	Variable:	CADMIUM mg/kg
Raw Statistics		Normal Distribution Test	
Number of Valid Samples	44	Shapiro-Wilk Test Statistic	0.592978
Number of Unique Samples	8	Shapiro-Wilk 5% Critical Value	0.944
Minimum	0.0025	Data not normal at 5% significance level	
Maximum	0.014		
Mean	0.004109	95% UCL (Assuming Normal Distribution)	
Median	0.0025	Student's-t UCL	0.004879
Standard Deviation	0.003039		
Variance	9.24E-06	Gamma Distribution Test	
Coefficient of Variation	0.7397	A-D Test Statistic	9.179578
Skewness	1.728113	A-D 5% Critical Value	0.756163
		K-S Test Statistic	0.464907
Gamma Statistics		K-S 5% Critical Value	0.134373
k hat	2.843092	Data do not follow gamma distribution	
k star (bias corrected)	2.664396	at 5% significance level	
Theta hat	0.001445		
Theta star	0.001542	95% UCLs (Assuming Gamma Distribution)	
nu hat	250.1921	Approximate Gamma UCL	0.004817
nu star	234.4669	Adjusted Gamma UCL	0.004843
Approx.Chi Square Value (.05)	200.0135		
Adjusted Level of Significance	0.044545	Lognormal Distribution Test	
Adjusted Chi Square Value	198.9374	Shapiro-Wilk Test Statistic	0.58414
		Shapiro-Wilk 5% Critical Value	0.944
Log-transformed Statistics		Data not lognormal at 5% significance level	
Minimum of log data	-5.991465		
Maximum of log data	-4.268698	95% UCLs (Assuming Lognormal Distribution)	
Mean of log data	-5.680607	95% H-UCL	0.004703
Standard Deviation of log data	0.558631	95% Chebyshev (MVUE) UCL	0.005517
Variance of log data	0.312068	97.5% Chebyshev (MVUE) UCL	0.006186
		99% Chebyshev (MVUE) UCL	0.0075
		95% Non-parametric UCLs	
		CLT UCL	0.004863
		Adj-CLT UCL (Adjusted for skewness)	0.00499
		Mod-t UCL (Adjusted for skewness)	0.004899
		Jackknife UCL	0.004879
		Standard Bootstrap UCL	0.004846
		Bootstrap-t UCL	0.0051
RECOMMENDATION		Hall's Bootstrap UCL	0.004928
Data are Non-parametric (0.05)		Percentile Bootstrap UCL	0.004866
		BCA Bootstrap UCL	0.005018
Use 95% Chebyshev (Mean, Sd) UCL		95% Chebyshev (Mean, Sd) UCL	0.006106
		97.5% Chebyshev (Mean, Sd) UCL	0.006971
		99% Chebyshev (Mean, Sd) UCL	0.008668

General Statistics

Data File	GW Area 1		Variable:	cis-1,2-DC mg/L	
Raw Statistics			Normal Distribution Test		
Number of Valid Samples	46		Shapiro-Wilk Test Statistic		0.4826
Number of Unique Samples	15		Shapiro-Wilk 5% Critical Value		0.945
Minimum	0.0005		Data not normal at 5% significance level		
Maximum	0.19				
Mean	0.018478		95% UCL (Assuming Normal Distribution)		
Median	0.0005		Student's-t UCL		0.029236
Standard Deviation	0.043445				
Variance	0.001887		Gamma Distribution Test		
Coefficient of Variation	2.351131		A-D Test Statistic		7.015353
Skewness	3.132033		A-D 5% Critical Value		0.860336
			K-S Test Statistic		0.353621
Gamma Statistics			K-S 5% Critical Value		0.141662
k hat	0.306905		Data do not follow gamma distribution		
k star (bias corrected)	0.301382		at 5% significance level		
Theta hat	0.060208				
Theta star	0.061312		95% UCLs (Assuming Gamma Distribution)		
nu hat	28.23527		Approximate Gamma UCL		0.030654
nu star	27.72717		Adjusted Gamma UCL		0.031172
Approx. Chi Square Value (.05)	16.7139				
Adjusted Level of Significance	0.044783		Lognormal Distribution Test		
Adjusted Chi Square Value	16.43613		Shapiro-Wilk Test Statistic		0.686072
			Shapiro-Wilk 5% Critical Value		0.945
Log-transformed Statistics			Data not lognormal at 5% significance level		
Minimum of log data	-7.600902				
Maximum of log data	-1.660731		95% UCLs (Assuming Lognormal Distribution)		
Mean of log data	-6.229667		95% H-UCL		0.046834
Standard Deviation of log data	2.031723		95% Chebyshev (MVUE) UCL		0.039686
Variance of log data	4.127898		97.5% Chebyshev (MVUE) UCL		0.050923
			99% Chebyshev (MVUE) UCL		0.072994
			95% Non-parametric UCLs		
			CLT UCL		0.029015
			Adj-CLT UCL (Adjusted for skewness)		0.032175
			Mod-t UCL (Adjusted for skewness)		0.029729
			Jackknife UCL		0.029236
			Standard Bootstrap UCL		0.029093
			Bootstrap-t UCL		0.038203
RECOMMENDATION			Hall's Bootstrap UCL		0.034181
Data are Non-parametric (0.05)			Percentile Bootstrap UCL		0.029278
			BCA Bootstrap UCL		0.033411
Use 99% Chebyshev (Mean, Sd) UCL			95% Chebyshev (Mean, Sd) UCL		0.0464
			97.5% Chebyshev (Mean, Sd) UCL		0.058481
			99% Ch		0.082213

General Statistics

Data File	GW Area 1		Variable: MANGANESE	mg/L
Raw Statistics		Normal Distribution Test		
Number of Valid Samples	44	Shapiro-Wilk Test Statistic		0.605794
Number of Unique Samples	33	Shapiro-Wilk 5% Critical Value		0.944
Minimum	0.093	Data not normal at 5% significance level		
Maximum	6.4			
Mean	0.864455	95% UCL (Assuming Normal Distribution)		
Median	0.41	Student's-t UCL		1.169275
Standard Deviation	1.202774			
Variance	1.446665	Gamma Distribution Test		
Coefficient of Variation	1.391368	A-D Test Statistic		1.590058
Skewness	3.185992	A-D 5% Critical Value		0.776431
		K-S Test Statistic		0.161137
Gamma Statistics		K-S 5% Critical Value		0.137123
k hat	1.041434	Data do not follow gamma distribution		
k star (bias corrected)	0.985578	at 5% significance level		
Theta hat	0.830062			
Theta star	0.877104	95% UCLs (Assuming Gamma Distribution)		
nu hat	91.64617	Approximate Gamma UCL		1.131551
nu star	86.7309	Adjusted Gamma UCL		1.142009
Approx. Chi Square Value (.05)	66.25855			
Adjusted Level of Significance	0.044545	Lognormal Distribution Test		
Adjusted Chi Square Value	65.6518	Shapiro-Wilk Test Statistic		0.960083
		Shapiro-Wilk 5% Critical Value		0.944
Log-transformed Statistics		Data are lognormal at 5% significance level		
Minimum of log data	-2.375156			
Maximum of log data	1.856298	95% UCLs (Assuming Lognormal Distribution)		
Mean of log data	-0.697304	95% H-		1.16888
Standard Deviation of log data	0.997002	95% Chebyshev (MVUE) UCL		1.422109
Variance of log data	0.994012	97.5% Chebyshev (MVUE) UCL		1.689057
		99% Chebyshev (MVUE) UCL		2.213425
		95% Non-parametric UCLs		
		CLT UCL		1.162708
		Adj-CLT UCL (Adjusted for skewness)		1.255766
		Mod-t UCL (Adjusted for skewness)		1.18379
		Jackknife UCL		1.169275
		Standard Bootstrap UCL		1.159788
		Bootstrap-t UCL		1.426336
RECOMMENDATION		Hall's Bootstrap UCL		1.481422
Data are lognormal (0.05)		Percentile Bootstrap UCL		1.161045
		BCA Bootstrap UCL		1.269386
Use H-UCL		95% Chebyshev (Mean, Sd) UCL		1.654832
		97.5% Chebyshev (Mean, Sd) UCL		1.996829
		99% Chebyshev (Mean, Sd) UCL		2.668616

General Statistics

Data File	GW Area 1		Variable:	MTBE	mg/L
Raw Statistics			Normal Distribution Test		
Number of Valid Samples	46		Shapiro-Wilk Test Statistic		0.699326
Number of Unique Samples	16		Shapiro-Wilk 5% Critical Value		0.945
Minimum	0.0005		Data not normal at 5% significance level		
Maximum	0.015				
Mean	0.002885		95% UCL (Assuming Normal Distribution)		
Median	0.0005		Student's-t UCL		0.003806
Standard Deviation	0.003719				
Variance	1.38E-05		Gamma Distribution Test		
Coefficient of Variation	1.289081		A-D Test Statistic		5.891066
Skewness	1.519179		A-D 5% Critical Value		0.790821
			K-S Test Statistic		0.384413
Gamma Statistics			K-S 5% Critical Value		0.135738
k hat	0.745782		Data do not follow gamma distribution		
k star (bias corrected)	0.711637		at 5% significance level		
Theta hat	0.003868				
Theta star	0.004054		95% UCLs (Assuming Gamma Distribution)		
nu hat	68.61192		Approximate Gamma UCL		0.003947
nu star	65.47057		Adjusted Gamma UCL		0.003988
Approx. Chi Square Value (.05)	47.84886				
Adjusted Level of Significance	0.044783		Lognormal Distribution Test		
Adjusted Chi Square Value	47.36075		Shapiro-Wilk Test Statistic		0.703818
			Shapiro-Wilk 5% Critical Value		0.945
Log-transformed Statistics			Data not lognormal at 5% significance level		
Minimum of log data	-7.600902				
Maximum of log data	-4.199705		95% UCLs (Assuming Lognormal Distribution)		
Mean of log data	-6.651614		95% H-UCL		0.00461
Standard Deviation of log data	1.251437		95% Chebyshev (MVUE) UCL		0.005498
Variance of log data	1.566093		97.5% Chebyshev (MVUE) UCL		0.006689
			99% Chebyshev (MVUE) UCL		0.009027
			95% Non-parametric UCLs		
			CLT UCL		0.003787
			Adj-CLT UCL (Adjusted for skewness)		0.003918
			Mod-t UCL (Adjusted for skewness)		0.003826
			Jackknife UCL		0.003806
			Standard Bootstrap UCL		0.003795
			Bootstrap-t UCL		0.003994
RECOMMENDATION			Hall's Bootstrap UCL		0.003929
Data are Non-parametric (0.05)			Percentile Bootstrap UCL		0.0038
			BCA Bootstrap UCL		0.003872
Use 99%			95% Chebyshev (Mean, Sd) UCL		0.005275
			97.5% Chebyshev (Mean, Sd) UCL		0.006309
			99% Ch		0.00834

General Statistics

Data File	GW Area 1		Variable: LEAD	mg/L	
Raw Statistics		Normal Distribution Test			
Number of Valid Samples	44	Shapiro-Wilk Test Statistic		0.788796	
Number of Unique Samples	23	Shapiro-Wilk 5% Critical Value		0.944	
Minimum	0.0025	Data not normal at 5% significance level			
Maximum	0.059				
Mean	0.014698	95% UCL (Assuming Normal Distribution)			
Median	0.00785	Student's-t UCL		0.01854	
Standard Deviation	0.015162				
Variance	0.00023	Gamma Distribution Test			
Coefficient of Variation	1.031607	A-D Test Statistic		1.76503	
Skewness	1.496726	A-D 5% Critical Value		0.77594	
		K-S Test Statistic		0.197536	
Gamma Statistics		K-S 5% Critical Value		0.137047	
k hat	1.066473	Data do not follow gamma distribution			
k star (bias corrected)	1.008911	at 5% significance level			
Theta hat	0.013782				
Theta star	0.014568	95% UCLs (Assuming Gamma Distribution)			
nu hat	93.84965	Approximate Gamma UCL		0.019174	
nu star	88.78414	Adjusted Gamma UCL		0.019349	
Approx. Chi Square Value (.05)	68.05615				
Adjusted Level of Significance	0.044545	Lognormal Distribution Test			
Adjusted Chi Square Value	67.44083	Shapiro-Wilk Test Statistic		0.860745	
Log-transformed Statistics		Shapiro-Wilk 5% Critical Value		0.944	
Minimum of log data	-5.991465	Data not lognormal at 5% significance level			
Maximum of log data	-2.830218	95% UCLs (Assuming Lognormal Distribution)			
Mean of log data	-4.757304	95% H-UCL		0.023163	
Standard Deviation of log data	1.084794	95% Chebyshev (MVUE) UCL		0.028059	
Variance of log data	1.176778	97.5% Chebyshev (MVUE) UCL		0.033643	
		99% Chebyshev (MVUE) UCL		0.04461	
		95% Non-parametric UCLs			
		CLT UCL		0.018458	
		Adj-CLT UCL (Adjusted for skewness)		0.019009	
		Mod-t UCL (Adjusted for skewness)		0.018626	
		Jackknife UCL		0.01854	
		Standard Bootstrap UCL		0.018353	
		Bootstrap-t UCL		0.019486	
RECOMMENDATION		Hall's Bootstrap UCL		0.019264	
Data are Non-parametric (0.05)		Percentile Bootstrap UCL		0.01862	
		BCA Bootstrap UCL		0.018709	
Use 99% Chebyshev (Mean, Sd) UCL		95% Chebyshev (Mean, Sd) UCL		0.024661	
		97.5% Chebyshev (Mean, Sd) UCL		0.028973	
		99% Ch		0.037441	

General Statistics

Data File	GW Area 1		Variable:	TCE	mg/L	
Raw Statistics			Normal Distribution Test			
Number of Valid Samples	46		Shapiro-Wilk Test Statistic		0.331948	
Number of Unique Samples	8		Shapiro-Wilk 5% Critical Value		0.945	
Minimum	0.0005		Data not normal at 5% significance level			
Maximum	0.019					
Mean	0.001417		95% UCL (Assuming Normal Distribution)			
Median	0.0005		Student's-t UCL		0.002226	
Standard Deviation	0.003265					
Variance	1.07E-05		Gamma Distribution Test			
Coefficient of Variation	2.303662		A-D Test Statistic		12.41536	
Skewness	4.478538		A-D 5% Critical Value		0.786111	
			K-S Test Statistic		0.489531	
Gamma Statistics			K-S 5% Critical Value		0.13523	
k hat	0.833421		Data do not follow gamma distribution			
k star (bias corrected)	0.79356		at 5% significance level			
Theta hat	0.001701					
Theta star	0.001786		95% UCLs (Assuming Gamma Distribution)			
nu hat	76.67471		Approximate Gamma UCL		0.001905	
nu star	73.00752		Adjusted Gamma UCL		0.001923	
Approx.Chi Square Value (.05)	54.32828					
Adjusted Level of Significance	0.044783		Lognormal Distribution Test			
Adjusted Chi Square Value	53.80638		Shapiro-Wilk Test Statistic		0.463566	
			Shapiro-Wilk 5% Critical Value		0.945	
Log-transformed Statistics			Data not lognormal at 5% significance level			
Minimum of log data	-7.600902					
Maximum of log data	-3.963316		95% UCLs (Assuming Lognormal Distribution)			
Mean of log data	-7.267261		95% H-UCL		0.001321	
Standard Deviation of log data	0.850304		95% Chebyshev (MVUE) UCL		0.001604	
Variance of log data	0.723016		97.5% Chebyshev (MVUE) UCL		0.00187	
			99% Chebyshev (MVUE) UCL		0.00239	
			95% Non-parametric UCLs			
			CLT UCL		0.002209	
			Adj-CLT UCL (Adjusted for skewness)		0.002549	
			Mod-t UCL (Adjusted for skewness)		0.002279	
			Jackknife UCL		0.002226	
			Standard Bootstrap UCL		0.002194	
			Bootstrap-t UCL		0.003833	
RECOMMENDATION			Hall's Bootstrap UCL		0.004518	
Data are Non-parametric (0.05)			Percentile Bootstrap UCL		0.002246	
			BCA Bootstrap UCL		0.002698	
Use 95% Chebyshev (Mean, Sd) UCL			95% Ch		0.003516	
			97.5% Chebyshev (Mean, Sd) UCL		0.004424	
			99% Chebyshev (Mean, Sd) UCL		0.006208	

General Statistics

Data File	GW Area 1		Variable: VC	
Raw Statistics		Normal Distribution Test		
Number of Valid Samples	46	Shapiro-Wilk Test Statistic	0.434817	
Number of Unique Samples	10	Shapiro-Wilk 5% Critical Value	0.945	
Minimum	0.0005	Data not normal at 5% significance level		
Maximum	0.14			
Mean	0.013948	95% UCL (Assuming Normal Distribution)		
Median	0.0005	Student's-t UCL	0.022772	
Standard Deviation	0.035637			
Variance	0.00127	Gamma Distribution Test		
Coefficient of Variation	2.555017	A-D Test Statistic	12.15728	
Skewness	2.65214	A-D 5% Critical Value	0.870978	
		K-S Test Statistic	0.498412	
Gamma Statistics		K-S 5% Critical Value	0.142381	
k hat	0.279517	Data do not follow gamma distribution		
k star (bias corrected)	0.275781	at 5% significance level		
Theta hat	0.0499			
Theta star	0.050576	95% UCLs (Assuming Gamma Distribution)		
nu hat	25.71558	Approximate Gamma UCL	0.023759	
nu star	25.37181	Adjusted Gamma UCL	0.024182	
Approx.Chi Square Value (.05)	14.89474			
Adjusted Level of Significance	0.044783	Lognormal Distribution Test		
Adjusted Chi Square Value	14.63394	Shapiro-Wilk Test Statistic	0.493064	
		Shapiro-Wilk 5% Critical Value	0.945	
Log-transformed Statistics		Data not lognormal at 5% significance level		
Minimum of log data	-7.600902			
Maximum of log data	-1.966113	95% UCLs (Assuming Lognormal Distribution)		
Mean of log data	-6.768016	95% H-UCL	0.015715	
Standard Deviation of log data	1.838014	95% Chebyshev (MVUE) UCL	0.015145	
Variance of log data	3.378295	97.5% Chebyshev (MVUE) UCL	0.019236	
		99% Chebyshev (MVUE) UCL	0.027273	
		95% Non-parametric UCLs		
		CLT UCL	0.022591	
		Adj-CLT UCL (Adjusted for skewness)	0.024786	
		Mod-t UCL (Adjusted for skewness)	0.023115	
		Jackknife UCL	0.022772	
		Standard Bootstrap UCL	0.022351	
		Bootstrap-t UCL	0.026693	
RECOMMENDATION		Hall's Bootstrap UCL	0.022972	
Data are Non-parametric (0.05)		Percentile Bootstrap UCL	0.0229	
		BCA Bootstrap UCL	0.0256	
Use 99% Chebyshev (Mean, Sd) UCL		95% Chebyshev (Mean, Sd) UCL	0.036851	
		97.5% Chebyshev (Mean, Sd) UCL	0.046761	
		99% Ch	0.066228	

Off-site Area 2 Groundwater VOC COPC Dataset

SAMPLE	Units	cis-1,2-DCE	1,4-Dioxane	TCE	VC
GW-8A	mg/L	0.0005	0.0025	0.0005	0.0005
GW-8A	mg/l	0.0005	0.0013	0.0005	0.0005
GW-8B	mg/L	0.0035	0.036	0.0005	0.0005
GW-8B	mg/L	0.0028	0.04	0.0005	0.0005
GW-8B	mg/L	0.0011	0.026	0.0005	0.0005
GW-8B	mg/L	0.002	0.018	0.0005	0.0005
GW-8B	mg/L	0.0005	0.0083	0.0005	0.0005
GW-8B	mg/l	0.0005	0.0096	0.0005	0.0005
GW-8B	mg/l	0.0005	0.0079	0.0005	0.0005
GW-8C	mg/L	0.006	0.1	0.0029	0.0023
GW-8C	mg/l	0.0054	0.067	0.002	0.0016
GW-8C	mg/l	0.0051	0.059	0.002	0.0005
GW-9A	mg/L	0.0026	0.0043	0.0005	0.0005
GW-9A	mg/l	0.0005	0.0015	0.0005	0.0005
GW-9B	mg/L	0.022	0.084	0.0094	0.0028
GW-9B	mg/L	0.029	0.073	0.013	0.0018
GW-9B	mg/L	0.0005	0.032	0.0005	0.0005
GW-9B	mg/L	0.005	0.023	0.0024	0.0005
GW-9B	mg/L	0.0005	0.038	0.0005	0.0005
GW-9B	mg/l	0.0016	0.024	0.0005	0.0005
GW-9B	mg/l	0.0005	0.035	0.0005	0.0005
GW-10A	mg/L	0.0005	0.0005	0.0005	0.0005
GW-10A	mg/l	0.0005	0.0011	0.0005	0.0005
GW-10B	mg/L	0.0019	0.052	0.0005	0.0005
GW-10B	mg/L	0.0026	0.069	0.0005	0.0014
GW-10B	mg/L	0.0024	0.043	0.0005	0.0012
GW-10B	mg/L	0.0011	0.013	0.0005	0.0005
GW-10B	mg/L	0.0005	0.038	0.0005	0.0005
GW-10B	mg/l	0.0005	0.033	0.0005	0.0005
GW-10B	mg/l	0.0005	0.024	0.0005	0.0005
GW-10C	mg/L	0.0005	0.23	0.0025	0.0018
GW-10C	mg/l	0.0005	0.24	0.0005	0.003
GW-10C	mg/l	0.0005	0.24	0.0005	0.0005
GW-12A	mg/L	0.0005	0.0005	0.0005	0.0005
GW-12A	mg/L	0.0005	0.05	0.0005	0.0005
GW-12A	mg/L	0.0026	0.0057	0.0005	0.0005
GW-12A	mg/l	0.12	0.044	0.0005	0.0005
GW-12A	mg/l	0.0005	0.000095	0.0005	0.0005
GW-12B	mg/L	0.0013	0.0005	0.0005	0.0005
GW-12B	mg/L	0.0005	0.05	0.0005	0.0005
GW-12B	mg/L	0.0005	0.0037	0.0005	0.0005
GW-12B	mg/l	0.0005	0.0036	0.0005	0.0005
GW-12B	mg/l	0.0005	0.0025	0.0005	0.0005
GW-12C	mg/L	0.0072	0.034	0.0005	0.0005
GW-12C	mg/L	0.042	0.05	0.0005	0.0005
GW-12C	mg/L	0.0019	0.063	0.0005	0.0005
GW-12C	mg/l	0.0018	0.043	0.0005	0.0005
GW-12C	mg/l	0.0005	0.068	0.0005	0.0005
MDC		0.12	0.24	0.013	0.003

Notes:

mg/L = milligrams/liter

MDC = maximum detected concentration

Off-site Area 2 Metals COPCs in Groundwater Dataset

SAMPLE	COLLECTION	Units	ARSENIC	CADMIUM	LEAD	MANGANESE
GW-8A	9/9/2004 11:00	mg/L	0.014	0.0025	0.03	1.9
GW-8A	11/16/2005 15:40	mg/l	0.015	0.0084	0.021	3.9
GW-8B	Dec-03	mg/L	0.005	0.0025	0.009	0.98
GW-8B	5/26/2004 16:00	mg/L	0.005	0.0025	0.0086	0.98
GW-8B	9/9/2004 11:20	mg/L	0.065	0.0025	0.045	1.1
GW-8B	5/11/2005 15:30	mg/L	0.021	0.0025	0.076	1.5
GW-8B	11/16/2005 16:00	mg/l	0.029	0.0025	0.034	1.2
GW-8B	4/13/2006 8:20	mg/l	0.015	0.0025	0.0025	0.6
GW-8C	5/11/2005 12:15	mg/L	0.01	0.0025	0.0067	0.98
GW-8C	11/16/2005 15:50	mg/l	0.0082	0.0025	0.019	1
GW-8C	4/13/2006 7:30	mg/l	0.0013	0.0025	0.0025	0.79
GW-9A	9/9/2004 10:00	mg/L	0.025	0.0025	0.012	0.39
GW-9A	11/16/2005 14:30	mg/l	0.022	0.0066	0.059	0.98
GW-9B	Dec-03	mg/L	0.014	0.0025	0.012	2.30
GW-9B	5/26/2004 16:30	mg/L	0.014	0.0025	0.012	2.3
GW-9B	9/9/2004 9:40	mg/L	0.011	0.0025	0.03	0.36
GW-9B	5/11/2005 12:00	mg/L	0.01	0.0025	0.011	0.58
GW-9B	11/16/2005 14:45	mg/l	0.002	0.0025	0.0025	0.35
GW-9B	4/12/2006 16:15	mg/l	0.036	0.0025	0.0025	0.32
GW-10A	9/9/2004 9:00	mg/L	0.018	0.0025	0.085	0.82
GW-10A	11/16/2005 13:25	mg/l	0.018	0.0025	0.037	0.86
GW-10B	Dec-03	mg/L	0.042	0.0025	0.003	0.47
GW-10B	5/26/2004 15:00	mg/L	0.042	0.0025	0.0025	0.47
GW-10B	9/9/2004 8:30	mg/L	0.025	0.0025	0.0066	0.43
GW-10B	5/11/2005 16:00	mg/L	0.023	0.0025	0.0025	0.32
GW-10B	11/16/2005 13:45	mg/l	0.05	0.0025	0.0025	0.3
GW-10B	4/12/2006 15:40	mg/l	0.038	0.0025	0.0025	0.28
GW-10C	5/12/2005 11:30	mg/L	0.05	0.025	0.13	16
GW-10C	11/16/2005 13:30	mg/l	0.0087	0.0025	0.0025	3
GW-10C	4/12/2006 16:00	mg/l	0.0034	0.0025	0.0025	2.7
GW-12A	Dec-03	mg/L	0.005	0.0025	0.003	8.10
GW-12A	5/26/2004 13:30	mg/L	0.005	0.0025	0.0025	8.1
GW-12A	9/10/2004 11:20	mg/L	0.065	0.014	0.19	9.1
GW-12A	5/12/2005 14:50	mg/L	0.045	0.048	0.56	25
GW-12A	11/16/2005 10:50	mg/l	0.0081	0.0025	0.027	6.9
GW-12A	4/12/2006 13:45	mg/l	0.0032	0.0025	0.0025	4.7
GW-12B	Dec-03	mg/L	0.005	0.0025	0.003	1.60
GW-12B	5/26/2004 14:30	mg/L	0.005	0.0025	0.0025	1.6
GW-12B	9/10/2004 10:20	mg/L	0.088	0.014	0.086	2.4
GW-12B	5/12/2005 14:00	mg/L	0.01	0.0025	0.0025	0.4
GW-12B	11/16/2005 10:55	mg/l	0.061	0.0025	0.034	1.4
GW-12B	4/12/2006 13:50	mg/l	0.024	0.0025	0.0025	0.4
GW-12C	Dec-03	mg/L	0.005	0.0025	0.003	1.30
GW-12C	5/26/2004 14:00	mg/L	0.005	0.0025	0.0025	1.3
GW-12C	9/10/2004 11:00	mg/L	0.005	0.0025	0.011	1.6
GW-12C	5/12/2005 16:30	mg/L	0.01	0.0025	0.0088	1.5
GW-12C	11/16/2005 10:45	mg/l	0.022	0.0025	0.027	2.1
GW-12C	4/12/2006 14:00	mg/l	0.001	0.0025	0.0025	1.4
Maximum Detected Concentration (MDC)			0.088	0.048	0.56	25

Definitions:

mg/L = Milligrams per liter

General Statistics

Data File	GW Area 2		Variable: cis-1,2-DCE	mg/L
Raw Statistics		Normal Distribution Test		
Number of Valid Samples	48	Shapiro-Wilk Test Statistic		0.33055
Number of Unique Samples	20	Shapiro-Wilk 5% Critical Value		0.947
Minimum	0.0005	Data not normal at 5% significance level		
Maximum	0.12			
Mean	0.005904	95% UCL (Assuming Normal Distribution)		
Median	0.0005	Student's-t UCL		0.010381
Standard Deviation	0.018484			
Variance	0.000342	Gamma Distribution Test		
Coefficient of Variation	3.130606	A-D Test Statistic		6.784919
Skewness	5.428422	A-D 5% Critical Value		0.826664
		K-S Test Statistic		0.262702
Gamma Statistics		K-S 5% Critical Value		0.136157
k hat	0.447242	Data do not follow gamma distribution		
k star (bias corrected)	0.433178	at 5% significance level		
Theta hat	0.013201			
Theta star	0.01363	95% UCLs (Assuming Gamma Distribution)		
nu hat	42.93522	Approximate Gamma UCL		0.008831
nu star	41.5851	Adjusted Gamma UCL		0.008944
Approx. Chi Square Value (.05)	27.80177			
Adjusted Level of Significance	0.045	Lognormal Distribution Test		
Adjusted Chi Square Value	27.45191	Shapiro-Wilk Test Statistic		0.76575
Log-transformed Statistics		Shapiro-Wilk 5% Critical Value		0.947
Minimum of log data	-7.600902	Data not lognormal at 5% significance level		
Maximum of log data	-2.120264			
Mean of log data	-6.577385	95% UCLs (Assuming Lognormal Distribution)		
Standard Deviation of log data	1.367127	95% H-UCL		0.006123
Variance of log data	1.869037	95% Chebyshev (MVUE) UCL		0.007192
		97.5% Chebyshev (MVUE) UCL		0.008826
		99% Chebyshev (MVUE) UCL		0.012034
		95% Non-parametric UCLs		
		CLT UCL		0.010292
		Adj-CLT UCL (Adjusted for skewness)		0.012526
		Mod-t UCL (Adjusted for skewness)		0.010729
		Jackknife UCL		0.010381
		Standard Bootstrap UCL		0.01026
		Bootstrap-t UCL		0.020649
RECOMMENDATION		Hall's Bootstrap UCL		0.023917
Data are Non-parametric (0.05)		Percentile Bootstrap UCL		0.010948
		BCA Bootstrap UCL		0.013754
Use 99% Chebyshev (Mean, Sd) UCL		95% Chebyshev (Mean, Sd) UCL		0.017533
		97.5% Chebyshev (Mean, Sd) UCL		0.022565
		99% Ch		0.032449

General Statistics

Data File	GW Area 2	Variable:	1,4-Dioxane	mg/L
Raw Statistics		Normal Distribution Test		
Number of Valid Samples	48	Shapiro-Wilk Test Statistic		0.670644
Number of Unique Samples	39	Shapiro-Wilk 5% Critical Value		0.947
Minimum	0.000095	Data not normal at 5% significance level		
Maximum	0.24			
Mean	0.043596	95% UCL (Assuming Normal Distribution)		
Median	0.0335	Student's-t UCL		0.057272
Standard Deviation	0.056468			
Variance	0.003189	Gamma Distribution Test		
Coefficient of Variation	1.295266	A-D Test Statistic		0.748988
Skewness	2.56681	A-D 5% Critical Value		0.80212
		K-S Test Statistic		0.119689
Gamma Statistics		K-S 5% Critical Value		0.134026
k hat	0.63396	Data follow gamma distribution		
k star (bias corrected)	0.608226	at 5% significance level		
Theta hat	0.068767			
Theta star	0.071677	95% UCLs (Assuming Gamma Distribution)		
nu hat	60.86014	Approx		0.060871
nu star	58.38972	Adjusted Gamma UCL		0.06151
Approx.Chi Square Value (.05)	41.81897			
Adjusted Level of Significance	0.045	Lognormal Distribution Test		
Adjusted Chi Square Value	41.38412	Shapiro-Wilk Test Statistic		0.904207
Log-transformed Statistics		Shapiro-Wilk 5% Critical Value		0.947
Minimum of log data	-9.261634	Data not lognormal at 5% significance level		
Maximum of log data	-1.427116	95% UCLs (Assuming Lognormal Distribution)		
Mean of log data	-4.099612	95% H-UCL		0.19486
Standard Deviation of log data	1.791284	95% Chebyshev (MVUE) UCL		0.196453
Variance of log data	3.208698	97.5% Chebyshev (MVUE) UCL		0.248517
		99% Chebyshev (MVUE) UCL		0.350787
		95% Non-parametric UCLs		
		CLT UCL		0.057002
		Adj-CLT UCL (Adjusted for skewness)		0.060229
		Mod-t UCL (Adjusted for skewness)		0.057775
		Jackknife UCL		0.057272
		Standard Bootstrap UCL		0.056702
		Bootstrap-t UCL		0.063185
RECOMMENDATION		Hall's Bootstrap UCL		0.060247
Data follow gamma distribution (0.05)		Percentile Bootstrap UCL		0.057191
		BCA Bootstrap UCL		0.06066
Use Approximate Gamma UCL		95% Chebyshev (Mean, Sd) UCL		0.079123
		97.5% Chebyshev (Mean, Sd) UCL		0.094495
		99% Chebyshev (Mean, Sd) UCL		0.124692

General Statistics

Data File	GW Area 2		Variable: ARSENIC	mg/L
Raw Statistics		Normal Distribution Test		
Number of Valid Samples	48	Shapiro-Wilk Test Statistic		0.830447
Number of Unique Samples	28	Shapiro-Wilk 5% Critical Value		0.947
Minimum	0.001	Data not normal at 5% significance level		
Maximum	0.088			
Mean	0.021102	95% UCL (Assuming Normal Distribution)		
Median	0.014	Student's-t UCL		0.025985
Standard Deviation	0.020163			
Variance	0.000407	Gamma Distribution Test		
Coefficient of Variation	0.955499	A-D Test Statistic		0.51786
Skewness	1.448918	A-D 5% Critical Value		0.774469
Gamma Statistics		K-S Test Statistic		0.117443
		K-S 5% Critical Value		0.13106
k hat	1.189248	Data follow gamma distribution		
k star (bias corrected)	1.128809	at 5% significance level		
Theta hat	0.017744			
Theta star	0.018694	95% UCLs (Assuming Gamma Distribution)		
nu hat	114.1678	Approx		0.026797
nu star	108.3657	Adjusted Gamma UCL		0.026997
Approx.Chi Square Value (.05)	85.33511			
Adjusted Level of Significance	0.045	Lognormal Distribution Test		
Adjusted Chi Square Value	84.70266	Shapiro-Wilk Test Statistic		0.965411
Log-transformed Statistics		Shapiro-Wilk 5% Critical Value		0.947
		Data are lognormal at 5% significance level		
Minimum of log data	-6.907755			
Maximum of log data	-2.430418	95% UCLs (Assuming Lognormal Distribution)		
Mean of log data	-4.334458	95% H-UCL		0.033279
Standard Deviation of log data	1.060442	95% Chebyshev (MVUE) UCL		0.04057
Variance of log data	1.124536	97.5% Chebyshev (MVUE) UCL		0.048347
		99% Chebyshev (MVUE) UCL		0.063623
		95% Non-parametric UCLs		
		CLT UCL		0.025889
		Adj-CLT UCL (Adjusted for skewness)		0.026539
		Mod-t UCL (Adjusted for skewness)		0.026087
		Jackknife UCL		0.025985
		Standard Bootstrap UCL		0.025873
		Bootstrap-t UCL		0.026979
		Hall's Bootstrap UCL		0.026649
RECOMMENDATION		Percentile Bootstrap UCL		0.025906
Data follow gamma distribution (0.05)		BCA Bootstrap UCL		0.026771
Use Approximate Gamma UCL		95% Chebyshev (Mean, Sd) UCL		0.033788
		97.5% Chebyshev (Mean, Sd) UCL		0.039277
		99% Chebyshev (Mean, Sd) UCL		0.050059

General Statistics

Data File	Area 2 Groundwater	Variable: CADMIUM	mg/L
Raw Statistics		Normal Distribution Test	
Number of Valid Samples	48	Shapiro-Wilk Test Statistic	0.332736
Number of Unique Samples	6	Shapiro-Wilk 5% Critical Value	0.947
Minimum	0.0025	Data not normal at 5% significance level	
Maximum	0.048		
Mean	0.004604	95% UCL (Assuming Normal Distribution)	
Median	0.0025	Student's-t UCL	0.006433
Standard Deviation	0.007551		
Variance	5.7E-05	Gamma Distribution Test	
Coefficient of Variation	1.640119	A-D Test Statistic	13.97141
Skewness	4.719611	A-D 5% Critical Value	0.768684
		K-S Test Statistic	0.521376
Gamma Statistics		K-S 5% Critical Value	0.130313
k hat	1.446526	Data do not follow gamma distribution at 5% significance level	
k star (bias corrected)	1.370007		
Theta hat	0.003183		
Theta star	0.003361	95% UCLs (Assuming Gamma Distribution)	
nu hat	138.8665	Approximate Gamma UCL	0.005711
nu star	131.5207	Adjusted Gamma UCL	0.00575
Approx. Chi Square Value (.05)	106.023		
Adjusted Level of Significance	0.045	Lognormal Distribution Test	
Adjusted Chi Square Value	105.3149	Shapiro-Wilk Test Statistic	0.40897
Log-transformed Statistics		Shapiro-Wilk 5% Critical Value	0.947
Minimum of log data	-5.991465	Data not lognormal at 5% significance level	
Maximum of log data	-3.036554		
Mean of log data	-5.764678	95% UCLs (Assuming Lognormal Distribution)	
Standard Deviation of log data	0.650887	95% H-UCL	0.004685
Variance of log data	0.423654	95% Chebyshev (MVUE) UCL	0.005564
		97.5% Chebyshev (MVUE) UCL	0.006303
		99% Chebyshev (MVUE) UCL	0.007755
		95% Non-parametric UCLs	
		CLT UCL	0.006397
		Adj-CLT UCL (Adjusted for skewness)	0.00719
		Mod-t UCL (Adjusted for skewness)	0.006557
		Jackknife UCL	0.006433
		Standard Bootstrap UCL	0.006359
		Bootstrap-t UCL	0.009718
RECOMMENDATION		Hall's Bootstrap UCL	0.012323
Data are Non-parametric (0.05)		Percentile Bootstrap UCL	0.006585
		BCA Bootstrap UCL	0.007325
Use 95% Chebyshev (Mean, Sd) UCL		95% Ch	0.009355
		97.5% Chebyshev (Mean, Sd) UCL	0.011411
		99% Chebyshev (Mean, Sd) UCL	0.015449

General Statistics

Data File	Area 2 Groundwater	Variable: MANGANESE	mg/L
Raw Statistics		Normal Distribution Test	
Number of Valid Samples	48	Shapiro-Wilk Test Statistic	0.54343
Number of Unique Samples	35	Shapiro-Wilk 5% Critical Value	0.947
Minimum	0.28	Data not normal at 5% significance level	
Maximum	25		
Mean	2.647083	95% UCL (Assuming Normal Distribution)	
Median	1.25	Student's-t UCL	3.716077
Standard Deviation	4.413904	Gamma Distribution Test	
Variance	19.48255	A-D Test Statistic	2.506024
Coefficient of Variation	1.667459	A-D 5% Critical Value	0.786877
Skewness	3.61644	K-S Test Statistic	0.207002
Gamma Statistics		K-S 5% Critical Value	0.132496
k hat	0.845179	Data do not follow gamma distribution at 5% significance level	
k star (bias corrected)	0.806244		
Theta hat	3.13198		
Theta star	3.283228	95% UCLs (Assuming Gamma Distribution)	
nu hat	81.13718	Approximate Gamma UCL	3.52461
nu star	77.39944	Adjusted Gamma UCL	3.556261
Approx. Chi Square Value (.05)	58.1292	Lognormal Distribution Test	
Adjusted Level of Significance	0.045	Shapiro-Wilk Test Statistic	0.936936
Adjusted Chi Square Value	57.61185	Shapiro-Wilk 5% Critical Value	0.947
Log-transformed Statistics		Data not lognormal at 5% significance level	
Minimum of log data	-1.272966	95% UCLs (Assuming Lognormal Distribution)	
Maximum of log data	3.218876	95% H-UCL	3.495256
Mean of log data	0.276247	95% Chebyshev (MVUE) UCL	4.256285
Standard Deviation of log data	1.087718	97.5% Chebyshev (MVUE) UCL	5.086789
Variance of log data	1.183131	99% Chebyshev (MVUE) UCL	6.718154
		95% Non-parametric UCLs	
		CLT UCL	3.695007
		Adj-CLT UCL (Adjusted for skewness)	4.050346
		Mod-t UCL (Adjusted for skewness)	3.771503
		Jackknife UCL	3.716077
		Standard Bootstrap UCL	3.695535
		Bootstrap-t UCL	4.715385
RECOMMENDATION		Hall's Bootstrap UCL	7.961927
Data are Non-parametric (0.05)		Percentile Bootstrap UCL	3.722917
		BCA Bootstrap UCL	4.072292
Use 99% Chebyshev (Mean, Sd) UCL		95% Chebyshev (Mean, Sd) UCL	5.424104
		97.5% Chebyshev (Mean, Sd) UCL	6.625723
		99% Ch	8.98607

General Statistics

Data File	Area 2 Groundwater	Variable: LEAD	mg/L
Raw Statistics		Normal Distribution Test	
Number of Valid Samples	48	Shapiro-Wilk Test Statistic	0.403247
Number of Unique Samples	23	Shapiro-Wilk 5% Critical Value	0.947
Minimum	0.0025	Data not normal at 5% significance level	
Maximum	0.56		
Mean	0.034213	95% UCL (Assuming Normal Distribution)	
Median	0.0087	Student's-t UCL	0.054968
Standard Deviation	0.085701		
Variance	0.007345	Gamma Distribution Test	
Coefficient of Variation	2.504955	A-D Test Statistic	3.601879
Skewness	5.275113	A-D 5% Critical Value	0.812937
		K-S Test Statistic	0.210355
Gamma Statistics		K-S 5% Critical Value	0.135068
k hat	0.511267	Data do not follow gamma distribution at 5% significance level	
k star (bias corrected)	0.493201		
Theta hat	0.066917		
Theta star	0.069368	95% UCLs (Assuming Gamma Distribution)	
nu hat	49.08159	Approximate Gamma UCL	0.049761
nu star	47.34733	Adjusted Gamma UCL	0.050349
Approx.Chi Square Value (.05)	32.55321		
Adjusted Level of Significance	0.045	Lognormal Distribution Test	
Adjusted Chi Square Value	32.17255	Shapiro-Wilk Test Statistic	0.852982
Log-transformed Statistics		Shapiro-Wilk 5% Critical Value	0.947
Minimum of log data	-5.991465	Data not lognormal at 5% significance level	
Maximum of log data	-0.579818	95% UCLs (Assuming Lognormal Distribution)	
Mean of log data	-4.613257	95% H-UCL	0.052146
Standard Deviation of log data	1.452889	95% Chebyshev (MVUE) UCL	0.05999
Variance of log data	2.110885	97.5% Chebyshev (MVUE) UCL	0.07413
		99% Chebyshev (MVUE) UCL	0.101907
		95% Non-parametric UCLs	
		CLT UCL	0.054559
		Adj-CLT UCL (Adjusted for skewness)	0.064623
		Mod-t UCL (Adjusted for skewness)	0.056538
		Jackknife UCL	0.054968
		Standard Bootstrap UCL	0.054676
		Bootstrap-t UCL	0.089104
RECOMMENDATION		Hall's Bootstrap UCL	0.129871
Data are Non-parametric (0.05)		Percentile Bootstrap UCL	0.055254
		BCA Bootstrap UCL	0.068273
Use 99% Chebyshev (Mean, Sd) UCL		95% Chebyshev (Mean, Sd) UCL	0.088131
		97.5% Chebyshev (Mean, Sd) UCL	0.111462
		99% Ch	0.157291

General Statistics

Data File	Groundwater Area 2	Variable: TCE	mg/L
Raw Statistics		Normal Distribution Test	
Number of Valid Samples	48	Shapiro-Wilk Test Statistic	0.335096
Number of Unique Samples	7	Shapiro-Wilk 5% Critical Value	0.947
Minimum	0.0005	Data not normal at 5% significance level	
Maximum	0.013		
Mean	0.00114	95% UCL (Assuming Normal Distribution)	
Median	0.0005	Student's-t UCL	0.00168
Standard Deviation	0.00223		
Variance	4.97E-06	Gamma Distribution Test	
Coefficient of Variation	1.956724	A-D Test Statistic	13.17062
Skewness	4.470574	A-D 5% Critical Value	0.777107
		K-S Test Statistic	0.512859
Gamma Statistics		K-S 5% Critical Value	0.131401
k hat	1.071897	Data do not follow gamma distribution	
k star (bias corrected)	1.018792	at 5% significance level	
Theta hat	0.001063		
Theta star	0.001119	95% UCLs (Assuming Gamma Distribution)	
nu hat	102.9021	Approximate Gamma UCL	0.001467
nu star	97.80407	Adjusted Gamma UCL	0.001478
Approx. Chi Square Value (.05)	75.98673		
Adjusted Level of Significance	0.045	Lognormal Distribution Test	
Adjusted Chi Square Value	75.39143	Shapiro-Wilk Test Statistic	0.442788
Log-transformed Statistics		Shapiro-Wilk 5% Critical Value	0.947
Minimum of log data	-7.600902	Data not lognormal at 5% significance level	
Maximum of log data	-4.342806		
Mean of log data	-7.31131	95% UCLs (Assuming Lognormal Distribution)	
Standard Deviation of log data	0.760484	95% H-UCL	0.001125
Variance of log data	0.578336	95% Chebyshev (MVUE) UCL	0.001355
		97.5% Chebyshev (MVUE) UCL	0.001558
		99% Chebyshev (MVUE) UCL	0.001957
		95% Non-parametric UCLs	
		CLT UCL	0.001669
		Adj-CLT UCL (Adjusted for skewness)	0.001891
		Mod-t UCL (Adjusted for skewness)	0.001714
		Jackknife UCL	0.00168
		Standard Bootstrap UCL	0.00168
		Bootstrap-t UCL	0.003038
RECOMMENDATION		Hall's Bootstrap UCL	0.003909
Data are Non-parametric (0.05)		Percentile Bootstrap UCL	0.001702
		BCA Bootstrap UCL	0.001952
Use 95% Chebyshev (Mean, Sd) UCL		95% Ch	0.002542
		97.5% Chebyshev (Mean, Sd) UCL	0.00315
		99% Chebyshev (Mean, Sd) UCL	0.004342

General Statistics

Data File	GW Area 2		Variable: VC	mg/L	
Raw Statistics		Normal Distribution Test			
Number of Valid Samples	48	Shapiro-Wilk Test Statistic		0.471076	
Number of Unique Samples	8	Shapiro-Wilk 5% Critical Value		0.947	
Minimum	0.0005	Data not normal at 5% significance level			
Maximum	0.003				
Mean	0.000748	95% UCL (Assuming Normal Distribution)			
Median	0.0005	Student's-t UCL		0.000897	
Standard Deviation	0.000614				
Variance	3.77E-07	Gamma Distribution Test			
Coefficient of Variation	0.82097	A-D Test Statistic		12.61171	
Skewness	2.542508	A-D 5% Critical Value		0.756785	
		K-S Test Statistic		0.50477	
Gamma Statistics		K-S 5% Critical Value		0.128849	
k hat	2.928001	Data do not follow gamma distribution			
k star (bias corrected)	2.75889	at 5% significance level			
Theta hat	0.000255				
Theta star	0.000271	95% UCLs (Assuming Gamma Distribution)			
nu hat	281.0881	Approximate Gamma UCL		0.000868	
nu star	264.8535	Adjusted Gamma UCL		0.000872	
Approx. Chi Square Value (.05)	228.1597				
Adjusted Level of Significance	0.045	Lognormal Distribution Test			
Adjusted Chi Square Value	227.1083	Shapiro-Wilk Test Statistic		0.479014	
Log-transformed Statistics		Shapiro-Wilk 5% Critical Value		0.947	
Minimum of log data	-7.600902	Data not lognormal at 5% significance level			
Maximum of log data	-5.809143				
Mean of log data	-7.378596	95% UCLs (Assuming Lognormal Distribution)			
Standard Deviation of log data	0.517689	95% H-UCL		0.000824	
Variance of log data	0.268002	95% Chebyshev (MVUE) UCL		0.000956	
		97.5% Chebyshev (MVUE) UCL		0.001062	
		99% Chebyshev (MVUE) UCL		0.001269	
		95% Non-parametric UCLs			
		CLT UCL		0.000894	
		Adj-CLT UCL (Adjusted for skewness)		0.000928	
		Mod-t UCL (Adjusted for skewness)		0.000902	
		Jackknife UCL		0.000897	
		Standard Bootstrap UCL		0.000888	
		Bootstrap-t UCL		0.000955	
RECOMMENDATION		Hall's Bootstrap UCL		0.000923	
Data are Non-parametric (0.05)		Percentile Bootstrap UCL		0.000894	
		BCA Bootstrap UCL		0.000923	
Use 95% Chebyshev (Mean, Sd) UCL		95% Ch		0.001134	
		97.5% Chebyshev (Mean, Sd) UCL		0.001301	
		99% Chebyshev (Mean, Sd) UCL		0.00163	

SOIL COPC DATASET FOR
CONSTRUCTION WORKER SCENARIO
QAS SITE
BLUE SUMMIT, MO

SAMPLE ID	SAMPLE DATE	UNITS	Methylene Chloride	1,1,2,2-Tetrachloroethane
97B14-6"	24-Nov-97	mg/Kg	60.5	0.0125 U
97B14-5.0'	24-Nov-97	mg/Kg	76.3	0.0125 U
97B14-10.0'	24-Nov-97	mg/Kg	83.5	0.0125 U
97B14-11.0'	24-Nov-97	mg/Kg	74.1	0.0125 U
97B14-15.0'	24-Nov-97	mg/Kg	109	0.0125 U
97B15-6"	25-Nov-97	mg/Kg	73.4	0.0125 U
97B15-5.0'	25-Nov-97	mg/Kg	95.5	0.0125 U
97B15-10.0'	25-Nov-97	mg/Kg	111	0.0125 U
97B15-15.0'	25-Nov-97	mg/Kg	0.05 U	0.0125 U
97B16-6"	26-Nov-97	mg/Kg	74.4	0.0125 U
97B16-5.0'	26-Nov-97	mg/Kg	78.1	0.0125 U
97B16-10.0'	26-Nov-97	mg/Kg	63.6	0.0125 U
97B16-15.0'	26-Nov-97	mg/Kg	0.05 U	0.0125 U
Number of Detects/Samples			11 13	0 13
MAX Detected Concentration (MDC)			111	0.0

U = UNDETECTED

COPCs IN SOILS (B1-B16, 0-2 ft)
OUTDOOR COMMERCIAL/INDUSTRIAL WORKER
QAS SITE
BLUE SUMMIT, MO

SAMPLE ID	SAMPLE DATE	UNITS	Methylene Chloride	1,1,2,2-Tetrachloroethane
97B1-4"	13-Oct-97	mg/Kg	0.05 U	15.3
97B2-4"	13-Oct-97	mg/Kg	0.05 U	0.0125 U
97B2-2.5'	13-Oct-97	mg/Kg	0.05 U	0.0125 U
97B3-3"	14-Oct-97	mg/Kg	0.05 U	0.0125 U
97B3-2.5'	14-Oct-97	mg/Kg	0.05 U	0.0125 U
97B4-3"	20-Oct-97	mg/Kg	0.05 U	0.0125 U
97B5-6"	20-Oct-97	mg/Kg	0.05 U	0.0125 U
97B6-4"	20-Oct-97	mg/Kg	0.05 U	0.0125 U
97B7-4"	21-Oct-97	mg/Kg	0.05 U	0.0125 U
97B7-6'	21-Oct-97	mg/Kg	0.05 U	0.0125 U
97B8-6"	21-Oct-97	mg/Kg	0.05 U	0.0125 U
97B9-2"	3-Nov-97	mg/Kg	0.05 U	0.0125 U
97B10-6"	4-Nov-97	mg/Kg	0.05 U	0.0125 U
97B11-6"	5-Nov-97	mg/Kg	0.05 U	0.0125 U
97B12-6"	10-Nov-97	mg/Kg	0.05 U	0.0125 U
97B13-6"	11-Nov-97	mg/Kg	0.05 U	0.0125 U
97B14-6"	24-Nov-97	mg/Kg	60.5	0.0125 U
97B15-6"	25-Nov-97	mg/Kg	73.4	0.0125 U
97B16-6"	26-Nov-97	mg/Kg	74.4	0.0125 U
Number of Detects/Samples			3 19	1 19
MAX Detected Concentration (MDC)			74.4	15.3

U = UNDETECTED

COPCs IN SURFACE SOILS (0-1 ft)
INDOOR COMMERCIAL/INDUSTRIAL WORKER SCENARIO
QAS SITE
BLUE SUMMIT, MO

SAMPLE ID	SAMPLE DATE	UNITS	Methylene Chloride	1,1,2,2-Tetrachloroethane
97B1-4"	13-Oct-97	mg/Kg	0.05 U	15.3
97B2-4"	13-Oct-97	mg/Kg	0.05 U	0.0125 U
97B3-3"	14-Oct-97	mg/Kg	0.05 U	0.0125 U
97B4-3"	20-Oct-97	mg/Kg	0.05 U	0.0125 U
97B5-6"	20-Oct-97	mg/Kg	0.05 U	0.0125 U
97B6-4"	20-Oct-97	mg/Kg	0.05 U	0.0125 U
97B7-4"	21-Oct-97	mg/Kg	0.05 U	0.0125 U
97B7-6'	21-Oct-97	mg/Kg	0.05 U	0.0125 U
97B8-6"	21-Oct-97	mg/Kg	0.05 U	0.0125 U
97B8-5'	21-Oct-97	mg/Kg	0.05 U	0.0125 U
97B9-2"	3-Nov-97	mg/Kg	0.05 U	0.0125 U
97B9-5'	3-Nov-97	mg/Kg	0.05 U	0.0125 U
97B10-6"	4-Nov-97	mg/Kg	0.05 U	0.0125 U
97B11-6"	5-Nov-97	mg/Kg	0.05 U	0.0125 U
97B12-6"	10-Nov-97	mg/Kg	0.05 U	0.0125 U
97B13-6"	11-Nov-97	mg/Kg	0.05 U	0.0125 U
Number of Detects/Samples			0 16	1 16
MAX Detected Concentration (MDC)			0	15.3

U = UNDETECTED

COPCs IN SOILS (0-15 ft) FOR
COMMERCIAL/INDUSTRIAL INDOOR WORKER - Subsurface Inhalation
QAS SITE
BLUE SUMMIT, MO

SAMPLE ID	SAMPLE DATE	UNITS	Methylene Chloride	1,1,2,2-Tetrachloroethane
97B1-4"	13-Oct-97	mg/Kg	0.05 U	15.3
97B2-4"	13-Oct-97	mg/Kg	0.05 U	0.0125 U
97B2-2.5'	13-Oct-97	mg/Kg	0.05 U	0.0125 U
97B2-7.5'	13-Oct-97	mg/Kg	0.05 U	0.0125 U
97B2-10.0'	13-Oct-97	mg/Kg	0.05 U	0.0125 U
97B2-12.5'	13-Oct-97	mg/Kg	0.05 U	0.0125 U
97B2-15'	13-Oct-97	mg/Kg	0.05 U	0.0125 U
97B3-3"	14-Oct-97	mg/Kg	0.05 U	0.0125 U
97B3-2.5'	14-Oct-97	mg/Kg	0.05 U	0.0125 U
97B3-5.0'	14-Oct-97	mg/Kg	0.05 U	0.0125 U
97B3-7.0'	14-Oct-97	mg/Kg	0.05 U	0.0125 U
97B3-10.0'	14-Oct-97	mg/Kg	0.05 U	0.0125 U
97B3-12.0'	14-Oct-97	mg/Kg	0.05 U	0.0125 U
97B3-15.0'	14-Oct-97	mg/Kg	0.05 U	0.0125 U
97B4-3"	20-Oct-97	mg/Kg	0.05 U	0.0125 U
97B5-6"	20-Oct-97	mg/Kg	0.05 U	0.0125 U
97B6-4"	20-Oct-97	mg/Kg	0.05 U	0.0125 U
97B6-10.0'	20-Oct-97	mg/Kg	0.05 U	0.0125 U
97B7-4"	21-Oct-97	mg/Kg	0.05 U	0.0125 U
97B7-6"	21-Oct-97	mg/Kg	0.05 U	0.0125 U
97B7-10.0'	21-Oct-97	mg/Kg	0.05 U	0.0125 U
97B7-15.0'	21-Oct-97	mg/Kg	0.05 U	0.0125 U
97B8-6"	21-Oct-97	mg/Kg	0.05 U	0.0125 U
97B8-5'	21-Oct-97	mg/Kg	0.05 U	0.0125 U
97B8-10'	21-Oct-97	mg/Kg	0.05 U	0.0125 U
97B8-15'	21-Oct-97	mg/Kg	0.05 U	0.0125 U
97B9-2"	3-Nov-97	mg/Kg	0.05 U	0.0125 U
97B9-5'	3-Nov-97	mg/Kg	0.05 U	0.0125 U
97B9-10.0'	3-Nov-97	mg/Kg	0.05 U	0.0125 U
97B9-15.0'	3-Nov-97	mg/Kg	0.05 U	0.0125 U
97B10-6"	4-Nov-97	mg/Kg	0.05 U	0.0125 U
97B10-5.0'	4-Nov-97	mg/Kg	0.05 U	0.0125 U
97B10-10.0'	4-Nov-97	mg/Kg	0.05 U	0.0125 U
97B10-15.0'	4-Nov-97	mg/Kg	0.05 U	0.0125 U
97B11-6"	5-Nov-97	mg/Kg	0.05 U	0.0125 U
97B11-10.0'	5-Nov-97	mg/Kg	0.05 U	0.0125 U
97B11-15.0'	6-Nov-97	mg/Kg	0.05 U	0.0125 U
97B12-6"	10-Nov-97	mg/Kg	0.05 U	0.0125 U
97B12-10.0'	10-Nov-97	mg/Kg	0.05 U	0.0125 U
97B12-15.0'	10-Nov-97	mg/Kg	0.05 U	0.0125 U
97B13-6"	11-Nov-97	mg/Kg	0.05 U	0.0125 U
97B13-10.0'	11-Nov-97	mg/Kg	0.05 U	0.0125 U
97B13-15.0'	11-Nov-97	mg/Kg	0.05 U	0.0125 U
Number of Detects/Samples			0 43	1 43
MAX Detected Concentration (MDC)			0	15.3

U = UNDETECTED

Summary of ProUCL Statistics
Construction Worker Scenario - Area 1 Soil

Data File: Soil (0-15') CW scenario

Variable: Methylene Chloride mg/kg

Raw Statistics		Normal Distribution Test	
Number of Valid Samples	13	Shapiro-Wilk Test Statistic	0.829803
Number of Unique Samples	12	Shapiro-Wilk 5% Critical Value	0.866
Minimum	0.025	Data not normal at 5% significance level	
Maximum	111	95% UCL (Assuming Normal Distribution)	
Mean	69.18846	Student's-t UCL	86.13473
Median	74.4	Gamma Distribution Test	
Standard Deviation	34.28214	A-D Test Statistic	3.288396
Variance	1175.265	A-D 5% Critical Value	0.784487
Coefficient of Variation	0.495489	K-S Test Statistic	0.483229
Skewness	-1.231434	K-S 5% Critical Value	0.248714
Gamma Statistics		Data do not follow gamma distribution at 5% significance level	
k hat	0.569539	95% UCLs (Assuming Gamma Distribution)	
k star (bias corrected)	0.489389	Approximate Gamma UCL	154.2698
Theta hat	121.4815	Adjusted Gamma UCL	174.2546
Theta star	141.3772	Lognormal Distribution Test	
nu hat	14.80802	Shapiro-Wilk Test Statistic	0.50154
nu star	12.72412	Shapiro-Wilk 5% Critical Value	0.866
Approx. Chi Square Value (.05)	5.70664	Data not lognormal at 5% significance level	
Adjusted Level of Significance	0.03009	95% UCLs (Assuming Lognormal Distribution)	
Adjusted Chi Square Value	5.05216	95% H-UCL	1147952
Log-transformed Statistics		95% Chebyshev (MVUE) UCL	3433.256
Minimum of log data	-3.688879	97.5% Chebyshev (MVUE) UCL	4599.733
Maximum of log data	4.70953	99% Chebyshev (MVUE) UCL	6891.051
Mean of log data	3.143524	95% Non-parametric UCLs	
Standard Deviation of log data	3.037634	CLT UCL	84.82798
Variance of log data	9.227223	Adj-CLT UCL (Adjusted for skewness)	81.35809
		Mod-t UCL (Adjusted for skewness)	85.59349
		Jackknife UCL	86.13473
		Standard Bootstrap UCL	84.41669
		Bootstrap-t UCL	83.26316
		Hall's Bootstrap UCL	82.20854
		Percentile Bootstrap UCL	82.98654
		BCA Bootstrap UCL	81.41731
		95% Chebyshev (Mean, Sd) UCL	110.6335
		97.5% Chebyshev (Mean, Sd) UCL	128.5669
		99% Chebyshev (Mean, Sd) UCL	163.7934

RECOMMENDATION

Data are Non-parametric (0.05)

Use Hall's Bootstrap UCL

Summary of ProUCL Statistics
Commercial Indoor Worker
Soil UCL C (0-1)I data

Data File: Soil (0-1') C/I Worker

Variable: 1,1,2,2-Tetrachloroethane

<u>Raw Statistics</u>		<u>Normal Distribution Test</u>		(mg/kg)
Number of Valid Samples	16	Shapiro-Wilk Test Statistic	0.272673	
Number of Unique Samples	2	Shapiro-Wilk 5% Critical Value	0.887	
Minimum	0.00625	Data not normal at 5% significance level		
Maximum	15.3	95% UCL (Assuming Normal Distribution)		
Mean	0.962109	Student's-t UCL	2.637779	
Median	0.00625	Gamma Distribution Test		
Standard Deviation	3.823438	A-D Test Statistic	6.040949	
Variance	14.61867	A-D 5% Critical Value	0.891123	
Coefficient of Variation	3.974015	K-S Test Statistic	0.59163	
Skewness	4	K-S 5% Critical Value	0.239038	
<u>Gamma Statistics</u>		Data do not follow gamma distribution at 5% significance level		
k hat	0.166396	95% UCLs (Assuming Gamma Distribution)		
k star (bias corrected)	0.176863	Approximate Gamma UCL	3.70924	
Theta hat	5.782044	Adjusted Gamma UCL	4.389739	
Theta star	5.439842	Lognormal Distribution Test		
nu hat	5.324674	Shapiro-Wilk Test Statistic	0.272673	
nu star	5.659631	Shapiro-Wilk 5% Critical Value	0.887	
Approx.Chi Square Value (.05)	1.468005	Data not lognormal at 5% significance level		
Adjusted Level of Significance	0.03348	95% UCLs (Assuming Lognormal Distribution)		
Adjusted Chi Square Value	1.240435	95% H-UCL	0.625673	
<u>Log-transformed Statistics</u>		95% Chebyshev (MVUE) UCL	0.18152	
Minimum of log data	-5.075174	97.5% Chebyshev (MVUE) UCL	0.237534	
Maximum of log data	2.727853	99% Chebyshev (MVUE) UCL	0.347563	
Mean of log data	-4.587485	95% Non-parametric UCLs		
Standard Deviation of log data	1.950757	CLT UCL	2.534358	
Variance of log data	3.805452	Adj-CLT UCL (Adjusted for skewness)	3.555708	
<u>RECOMMENDATION</u>		Mod-t UCL (Adjusted for skewness)	2.797089	
Data are Non-parametric (0.05)		Jackknife UCL	2.637779	
Use 99% Chebyshev (Mean, Sd) UCL		Standard Bootstrap UCL	N/R	
		Bootstrap-t UCL	N/R	
		Hall's Bootstrap UCL	N/A	
		Percentile Bootstrap UCL	N/R	
		BCA Bootstrap UCL	N/R	
		95% Chebyshev (Mean, Sd) UCL	5.128604	
		97.5% Chebyshev (Mean, Sd) UCL	6.931449	
		99% Ch	10.47279	

Summary of ProUCL Statistics
C/I Indoor Worker
Soil UCL CI Ind (0-13) data

Data File: Area 1 B1 to B13 (0-15')

Variable: 1,1,2,2-Tetrachloroethane

		mg/kg	
Raw Statistics		Normal Distribution Test	
Number of Valid Samples	43	Shapiro-Wilk Test Statistic	0.155243
Number of Unique Samples	2	Shapiro-Wilk 5% Critical Value	0.943
Minimum	0.00625	Data not normal at 5% significance level	
Maximum	15.3	95% UCL (Assuming Normal Distribution)	
Mean	0.361919	Student's-t UCL	0.960136
Median	0.00625	Gamma Distribution Test	
Standard Deviation	2.332275	A-D Test Statistic	18.16116
Variance	5.439507	A-D 5% Critical Value	0.909868
Coefficient of Variation	6.444198	K-S Test Statistic	0.612473
Skewness	6.557439	K-S 5% Critical Value	0.149735
Gamma Statistics		Data do not follow gamma distribution at 5% significance level	
k hat	0.191139	95% UCLs (Assuming Gamma Distribution)	
k star (bias corrected)	0.193307	Approximate Gamma UCL	0.715999
Theta hat	1.893485	Adjusted Gamma UCL	0.733782
Theta star	1.872243	Lognormal Distribution Test	
nu hat	16.43794	Shapiro-Wilk Test Statistic	0.155243
nu star	16.62444	Shapiro-Wilk 5% Critical Value	0.943
Approx.Chi Square Value (.05)	8.403215	Data not lognormal at 5% significance level	
Adjusted Level of Significance	0.044419	95% UCLs (Assuming Lognormal Distribution)	
Adjusted Chi Square Value	8.199564	95% H-UCL	0.024382
Log-transformed Statistics		95% Chebyshev (MVUE) UCL	0.029132
Minimum of log data	-5.075174	97.5% Chebyshev (MVUE) UCL	0.035331
Maximum of log data	2.727853	99% Chebyshev (MVUE) UCL	0.047506
Mean of log data	-4.893708	95% Non-parametric UCLs	
Standard Deviation of log data	1.18995	CLT UCL	0.946941
Variance of log data	1.415982	Adj-CLT UCL (Adjusted for skewness)	1.326978
<div style="border: 1px solid black; padding: 5px; width: fit-content;"> <p style="text-align: center;">RECOMMENDATION</p> <p style="text-align: center;">Data are Non-parametric (0.05)</p> <p style="text-align: center;">Use 99% Chebyshev (Mean, Sd) UCL</p> </div>		Mod-t UCL (Adjusted for skewness)	1.019414
		Jackknife UCL	0.960136
		Standard Bootstrap UCL	N/R
		Bootstrap-t UCL	N/R
		Hall's Bootstrap UCL	N/A
		Percentile Bootstrap UCL	N/R
		BCA Bootstrap UCL	N/R
		95% Chebyshev (Mean, Sd) UCL	1.912242
		97.5% Chebyshev (Mean, Sd) UCL	2.583068
		99% Ch	3.900777

Summary of ProUCL Statistics
Area 1 Soils for Outdoor C/I Worker (0-2 ft)
MetCl2

Data File: Soils, 0-2 ft - Area 1 Outdoor Worker		Variable: Methylene Chloride	mg/kg
<u>Raw Statistics</u>		<u>Normal Distribution Test</u>	
Number of Valid Samples	19	Shapiro-Wilk Test Statistic	0.457196
Number of Unique Samples	4	Shapiro-Wilk 5% Critical Value	0.901
Minimum	0.025	Data not normal at 5% significance level	
Maximum	74.4	95% UCL (Assuming Normal Distribution)	
Mean	10.98421	Student's-t UCL	21.37962
Median	0.025	<u>Gamma Distribution Test</u>	
Standard Deviation	26.13084	A-D Test Statistic	5.416214
Variance	682.8208	A-D 5% Critical Value	0.903422
Coefficient of Variation	2.378946	K-S Test Statistic	0.534751
Skewness	2.082847	K-S 5% Critical Value	0.221409
<u>Gamma Statistics</u>		Data do not follow gamma distribution at 5% significance level	
k hat	0.157816	95% UCLs (Assuming Gamma Distribution)	
k star (bias corrected)	0.167985	Approximate Gamma UCL	38.14206
Theta hat	69.60153	Adjusted Gamma UCL	42.92036
Theta star	65.388	<u>Lognormal Distribution Test</u>	
nu hat	5.996994	Shapiro-Wilk Test Statistic	0.446943
nu star	6.383434	Shapiro-Wilk 5% Critical Value	0.901
Approx.Chi Square Value (.05)	1.838311	Data not lognormal at 5% significance level	
Adjusted Level of Significance	0.03687	95% UCLs (Assuming Lognormal Distribution)	
Adjusted Chi Square Value	1.633653	95% H-UCL	501.8941
<u>Log-transformed Statistics</u>		95% Chebyshev (MVUE) UCL	13.89688
Minimum of log data	-3.688879	97.5% Chebyshev (MVUE) UCL	18.55988
Maximum of log data	4.309456	99% Chebyshev (MVUE) UCL	27.71942
Mean of log data	-2.437581	<u>95% Non-parametric UCLs</u>	
Standard Deviation of log data	2.969185	CLT UCL	20.84482
Variance of log data	8.816061	Adj-CLT UCL (Adjusted for skewness)	23.90564
		Mod-t UCL (Adjusted for skewness)	21.85704
		Jackknife UCL	21.37962
		Standard Bootstrap UCL	N/R
		Bootstrap-t UCL	N/R
		Hall's Bootstrap UCL	N/R
		Percentile Bootstrap UCL	N/R
		BCA Bootstrap UCL	N/R
		95% Chebyshev (Mean, Sd) UCL	37.11505
		97.5% Chebyshev (Mean, Sd) UCL	48.42189
		99% Ch	70.63198

RECOMMENDATION

Data are Non-parametric (0.05)

Use 99% Chebyshev (Mean, Sd) UCL

Summary of ProUCL Statistics
Area 1 Soils for Outdoor C/I Worker (0-2 ft)
1,1,2,2-TCA

Data File: Area 1 Soil, 0-2 ft - Outdoor Worker

Variable: 1,1,2,2-Tetrachloroethane

Raw Statistics		Normal Distribution Test	
Number of Valid Samples	19	Shapiro-Wilk Test Statistic	0.244011
Number of Unique Samples	2	Shapiro-Wilk 5% Critical Value	0.901
Minimum	0.0063	Data not normal at 5% significance level	
Maximum	15.3	95% UCL (Assuming Normal Distribution)	
Mean	0.811232	Student's-t UCL	2.207034
Median	0.0063	Gamma Distribution Test	
Standard Deviation	3.508615	A-D Test Statistic	7.385328
Variance	12.31038	A-D 5% Critical Value	0.899
Coefficient of Variation	4.325048	K-S Test Statistic	0.597244
Skewness	4.358899	K-S 5% Critical Value	0.220968
Gamma Statistics		Data do not follow gamma distribution at 5% significance level	
k hat	0.169681	95% UCLs (Assuming Gamma Distribution)	
k star (bias corrected)	0.177977	Approximate Gamma UCL	2.688217
Theta hat	4.780922	Adjusted Gamma UCL	3.01081
Theta star	4.558071	Lognormal Distribution Test	
nu hat	6.447877	Shapiro-Wilk Test Statistic	0.244011
nu star	6.763125	Shapiro-Wilk 5% Critical Value	0.901
Approx.Chi Square Value (.05)	2.040929	Data not lognormal at 5% significance level	
Adjusted Level of Significance	0.03687	95% UCLs (Assuming Lognormal Distribution)	
Adjusted Chi Square Value	1.822254	95% H-UCL	0.243832
Log-transformed Statistics		95% Chebyshev (MVUE) UCL	0.124001
Minimum of log data	-5.067206	97.5% Chebyshev (MVUE) UCL	0.160706
Maximum of log data	2.727853	99% Chebyshev (MVUE) UCL	0.232806
Mean of log data	-4.656939	95% Non-parametric UCLs	
Standard Deviation of log data	1.788309	CLT UCL	2.135226
Variance of log data	3.198049	Adj-CLT UCL (Adjusted for skewness)	2.995307
<div style="border: 1px solid black; padding: 5px; text-align: center;"> RECOMMENDATION Data are Non-parametric (0.05) Use 99% Chebyshev (Mean, Sd) UCL </div>		Mod-t UCL (Adjusted for skewness)	2.341189
		Jackknife UCL	2.207034
		Standard Bootstrap UCL	N/R
		Bootstrap-t UCL	N/R
		Hall's Bootstrap UCL	N/A
		Percentile Bootstrap UCL	N/R
		BCA Bootstrap UCL	N/R
		95% Chebyshev (Mean, Sd) UCL	4.319847
		97.5% Chebyshev (Mean, Sd) UCL	5.838028
		99% Ch	8.8202

APPENDIX

F

APPENDIX F

Johnson & Ettinger Model Output Sheets

GW-ADV
Version 3.0; 02/03

Reset to
Defaults

CALCULATE RISK-BASED GROUNDWATER CONCENTRATION (enter "X" in "YES" box)

YES ☐

OR

CALCULATE INCREMENTAL RISKS FROM ACTUAL GROUNDWATER CONCENTRATION (enter "X" in "YES" box and initial groundwater conc. below)

YES ☒

ENTER
Chemical
CAS No.
(numbers only,
no dashes)

ENTER
Initial
groundwater
conc.,
 C_w
($\mu\text{g/L}$)

Chemical

123911 1.16E+03

1,4-Dioxane

ENTER Average soil/ groundwater temperature, T_s (°C)	ENTER Depth below grade to bottom of enclosed space floor, L_F (cm)	ENTER Depth below grade to water table, L_{WT} (cm)	ENTER Thickness of soil stratum A, (Enter value or 0) h_A (cm)	ENTER Thickness of soil stratum B, (Enter value or 0) h_B (cm)	ENTER Thickness of soil stratum C, (Enter value or 0) h_C (cm)	ENTER Soil stratum directly above water table, (Enter A, B, or C) water table	ENTER SCS soil type directly above water table	ENTER Soil stratum A SCS soil type (used to estimate soil vapor permeability)	ENTER User-defined stratum A soil vapor permeability, k_v (cm^2)
10	15	300	300	0	0	A		SCS	

MORE
↓

ENTER Stratum A soil type Lookup Soil Parameters	ENTER Stratum A soil dry bulk density, ρ_b^A (g/cm^3)	ENTER Stratum A soil total porosity, n^A (unitless)	ENTER Stratum A soil water-filled porosity, θ_w^A (cm^3/cm^3)	ENTER Stratum B soil type Lookup Soil Parameters	ENTER Stratum B soil dry bulk density, ρ_b^B (g/cm^3)	ENTER Stratum B soil total porosity, n^B (unitless)	ENTER Stratum B soil water-filled porosity, θ_w^B (cm^3/cm^3)	ENTER Stratum C soil type Lookup Soil Parameters	ENTER Stratum C soil dry bulk density, ρ_b^C (g/cm^3)	ENTER Stratum C soil total porosity, n^C (unitless)	ENTER Stratum C soil water-filled porosity, θ_w^C (cm^3/cm^3)
		0.43	0.3			0.43	0.17				

MORE
↓

ENTER Enclosed space thickness, L_{crack} (cm)	ENTER Soil-bldg. pressure differential, ΔP ($\text{g/cm}^2\text{-s}^2$)	ENTER Enclosed space length, L_g (cm)	ENTER Enclosed space width, W_B (cm)	ENTER Enclosed space height, H_B (cm)	ENTER Floor-wall seam crack width, w (cm)	ENTER Indoor air exchange rate, ER (1/h)	ENTER Average vapor flow rate into bldg. OR Leave blank to calculate Q_{soil} (L/m)
15	40	1000	1000	244	0.1	0.83	

MORE
↓

ENTER Averaging time for carcinogens, AT_c (yrs)	ENTER Averaging time for noncarcinogens, AT_{nc} (yrs)	ENTER Exposure duration, ED (yrs)	ENTER Exposure frequency, EF (days/yr)	ENTER Target risk for carcinogens, TR (unitless)	ENTER Target hazard quotient for noncarcinogens, THQ (unitless)
70	25	25	225	1.0E-06	1

MORE
↓

END

Used to calculate risk-based
groundwater concentration.

RESULTS SHEET FOR QAS Ind_GWtoAir-14Dioxane_07

OFF-Site Area 1

QAS Site

Blue Summit, MO

RISK-BASED GROUNDWATER CONCENTRATION CALCULATIONS:

INCREMENTAL RISK CALCULATIONS:

Indoor exposure groundwater conc., carcinogen (µg/L)	Indoor exposure groundwater conc., noncarcinogen (µg/L)	Risk-based indoor exposure groundwater conc., (µg/L)	Pure component water solubility, S (µg/L)	Final indoor exposure groundwater conc., (µg/L)
NA	NA	NA	1.00E+09	NA

Incremental risk from vapor intrusion to indoor air, carcinogen (unitless)	Hazard quotient from vapor intrusion to indoor air, noncarcinogen (unitless)
2.9E-09	3.4E-07

MESSAGE AND ERROR SUMMARY BELOW: (DO NOT USE RESULTS IF ERRORS ARE PRESENT)

SCROLL
DOWN
TO "END"

END

CHEMICAL PROPERTIES SHEET for QAS Ind_GWtoAir-14Dioxane_07

Diffusivity in air, D_a (cm ² /s)	Diffusivity in water, D_w (cm ² /s)	Henry's law constant at reference temperature, H (atm-m ³ /mol)	Henry's law constant reference temperature, T_R (°C)	Enthalpy of vaporization at the normal boiling point, $\Delta H_{v,b}$ (cal/mol)	Normal boiling point, T_B (°K)	Critical temperature, T_C (°K)	Organic carbon partition coefficient, K_{oc} (cm ³ /g)	Pure component water solubility, S (mg/L)	Unit risk factor, URF (µg/m ³) ⁻¹	Reference conc., RfC (mg/m ³)
2.30E-01	1.00E-05	4.80E-06	25	8,687	374.25	585.15	1.70E+01	1.00E+06	7.7E-06	3.0E+00

END

INTERMEDIATE CALCULATIONS SHEET
QAS Ind_GWtoAir-14Dioxane_07

Exposure duration, τ (sec)	Source-building separation, L_T (cm)	Stratum A soil air-filled porosity, θ_a^A (cm ³ /cm ³)	Stratum B soil air-filled porosity, θ_a^B (cm ³ /cm ³)	Stratum C soil air-filled porosity, θ_a^C (cm ³ /cm ³)	Stratum A effective total fluid saturation, S_{fe} (cm ³ /cm ³)	Stratum A soil intrinsic permeability, k_i (cm ²)	Stratum A soil relative air permeability, k_{ra} (cm ²)	Stratum A soil effective vapor permeability, k_v (cm ²)	Thickness of capillary zone, L_{cz} (cm)	Total porosity in capillary zone, n_{cz} (cm ³ /cm ³)	Air-filled porosity in capillary zone, $\theta_{a,cz}$ (cm ³ /cm ³)	Water-filled porosity in capillary zone, $\theta_{w,cz}$ (cm ³ /cm ³)	Floor-wall seam perimeter, X_{crack} (cm)
7.88E+08	285	0.130	0.260	#VALUE!	0.592	1.48E-09	0.601	8.91E-10	192.31	0.43	0.006	0.424	4,000

Bldg. ventilation rate, $Q_{building}$ (cm ³ /s)	Area of enclosed space below grade, A_g (cm ²)	Crack-to-total area ratio, η (unitless)	Crack depth below grade, Z_{crack} (cm)	Enthalpy of vaporization at ave. groundwater temperature, $\Delta H_{v,TS}$ (cal/mol)	Henry's law constant at ave. groundwater temperature, H_{TS} (atm-m ³ /mol)	Henry's law constant at ave. groundwater temperature, H_{TS} (unitless)	Vapor viscosity at ave. soil temperature, μ_{TS} (g/cm-s)	Stratum A effective diffusion coefficient, D^{eff}_A (cm ² /s)	Stratum B effective diffusion coefficient, D^{eff}_B (cm ² /s)	Stratum C effective diffusion coefficient, D^{eff}_C (cm ² /s)	Capillary zone effective diffusion coefficient, D^{eff}_{cz} (cm ² /s)	Total overall effective diffusion coefficient, D^{eff}_T (cm ² /s)	Diffusion path length, L_d (cm)
5.63E+04	1.00E+06	4.00E-04	15	9,876	1.99E-06	8.55E-05	1.75E-04	1.29E-02	0.00E+00	0.00E+00	3.62E-02	2.28E-02	285

Convection path length, L_p (cm)	Source vapor conc., C_{source} (µg/m ³)	Crack radius, r_{crack} (cm)	Average vapor flow rate into bldg., Q_{soil} (cm ³ /s)	Crack effective diffusion coefficient, D^{crack} (cm ² /s)	Area of crack, A_{crack} (cm ²)	Exponent of equivalent foundation Peclet number, $\exp(Pe')$ (unitless)	Infinite source indoor attenuation coefficient, α (unitless)	Infinite source bldg. conc., $C_{building}$ (µg/m ³)	Unit risk factor, URF (µg/m ³) ⁻¹	Reference conc., RfC (mg/m ³)
15	9.92E+01	0.10	8.96E-01	1.29E-02	4.00E+02	1.36E+01	1.70E-05	1.68E-03	7.7E-06	3.0E+00

END

RESULTS SHEET FOR QAS Ind_GWtoAir-TCE(LB)_07
OFF-SITE AREA 1
QAS Site

RISK-BASED GROUNDWATER CONCENTRATION CALCULATIONS:

Indoor exposure groundwater conc., carcinogen (µg/L)	Indoor exposure groundwater conc., noncarcinogen (µg/L)	Risk-based indoor exposure groundwater conc., (µg/L)	Pure component water solubility, S (µg/L)	Final indoor exposure groundwater conc., (µg/L)
NA	NA	NA	1.47E+06	NA

INCREMENTAL RISK CALCULATIONS:

Incremental risk from vapor intrusion to indoor air, carcinogen (unitless)	Hazard quotient from vapor intrusion to indoor air, noncarcinogen (unitless)
2.0E-09	1.3E-05

MESSAGE AND ERROR SUMMARY BELOW: (DO NOT USE RESULTS IF ERRORS ARE PRESENT)

MESSAGE: Risk/HQ or risk-based groundwater concentration is based on a route-to-route extrapolation.

SCROLL
DOWN
TO "END"

END

GROUNDWATER TO INDOOR AIR SUMMARY SHEET FOR QAS Ind_GWtoAir-TCE(LB)_07

GW-ADV
Version 3.0; 02/03Reset to
Defaults

CALCULATE RISK-BASED GROUNDWATER CONCENTRATION (enter "X" in "YES" box)

YES

OR

CALCULATE INCREMENTAL RISKS FROM ACTUAL GROUNDWATER CONCENTRATION (enter "X" in "YES" box and initial groundwater conc. below)

YES

X

ENTER Chemical CAS No. (numbers only, no dashes)		ENTER Initial groundwater conc., C_w ($\mu\text{g/L}$)		Chemical							
79016		3.50E+00		Trichloroethylenes							
ENTER Average soil/ groundwater temperature, T_s ($^{\circ}\text{C}$)		ENTER Depth below grade to bottom of enclosed space floor, L_f (cm)		ENTER Depth below grade to water table, L_{WT} (cm)		ENTER Thickness of soil stratum A, h_A (cm)		ENTER Thickness of soil stratum B, (Enter value or 0) h_B (cm)		ENTER Thickness of soil stratum C, (Enter value or 0) h_C (cm)	
10		15		300		300		0		0	
ENTER Soil stratum directly above water table, (Enter A, B, or C)		ENTER SCS soil type directly above water table		ENTER Soil stratum A SCS soil type (used to estimate soil vapor permeability)		OR		ENTER User-defined stratum A soil vapor permeability, k_v (cm^2)			
A		SIC		SIC							
ENTER Stratum A SCS soil type Lookup Soil Parameters		ENTER Stratum A soil dry bulk density, ρ_b^A (g/cm^3)		ENTER Stratum A soil total porosity, n^A (unitless)		ENTER Stratum A soil water-filled porosity, θ_w^A (cm^3/cm^3)		ENTER Stratum B SCS soil type Lookup Soil Parameters		ENTER Stratum B soil dry bulk density, ρ_b^B (g/cm^3)	
SIC		1.5		0.43		0.3		SIC		1.7	
ENTER Stratum B soil total porosity, n^B (unitless)		ENTER Stratum B soil water-filled porosity, θ_w^B (cm^3/cm^3)		ENTER Stratum C SCS soil type Lookup Soil Parameters		ENTER Stratum C soil dry bulk density, ρ_b^C (g/cm^3)		ENTER Stratum C soil total porosity, n^C (unitless)		ENTER Stratum C soil water-filled porosity, θ_w^C (cm^3/cm^3)	
0.43		0.17				Error		Error		Error	
ENTER Enclosed space floor thickness, L_{crack} (cm)		ENTER Soil-bldg. pressure differential, ΔP ($\text{g/cm}^2\text{-s}^2$)		ENTER Enclosed space floor length, L_B (cm)		ENTER Enclosed space floor width, W_B (cm)		ENTER Enclosed space height, H_B (cm)		ENTER Floor-wall seam crack width, w (cm)	
15		40		1000		1000		244		0.1	
ENTER Indoor air exchange rate, ER (1/h)		ENTER Average vapor flow rate into bldg. OR Leave blank to calculate Q_{soil} (L/m)									
0.83											
ENTER Averaging time for carcinogens, AT_C (yrs)		ENTER Averaging time for noncarcinogens, AT_{NC} (yrs)		ENTER Exposure duration, ED (yrs)		ENTER Exposure frequency, EF (days/yr)		ENTER Target risk for carcinogens, TR (unitless)		ENTER Target hazard quotient for noncarcinogens, THQ (unitless)	
70		25		25		225		1.0E-06		1	
								Used to calculate risk-based groundwater concentration.			

END

CHEMICAL PROPERTIES FOR QAS Ind_GWtoAir-TCE(LB)_07

Diffusivity in air, D_a (cm ² /s)	Diffusivity in water, D_w (cm ² /s)	Henry's law constant at reference temperature, H (atm-m ³ /mol)	Henry's law constant reference temperature, T_R (°C)	Enthalpy of vaporization at the normal boiling point, $\Delta H_{v,b}$ (cal/mol)	Normal boiling point, T_B (°K)	Critical temperature, T_C (°K)	Organic carbon partition coefficient, K_{oc} (cm ³ /g)	Pure component water solubility, S (mg/L)	Unit risk factor, URF (µg/m ³) ⁻¹	Reference conc., RfC (mg/m ³)
7.90E-02	9.10E-06	1.03E-02	25	7,505	360.36	544.20	1.66E+02	1.47E+03	1.1E-05	4.0E-02

END

INTERMEDIATE CALCULATIONS SHEET for QAS Ind_GWtoAir-TCE(LB)_07
Off-Site Area 1

Exposure duration, τ (sec)	Source-building separation, L_T (cm)	Stratum A soil air-filled porosity, θ_a^A (cm ³ /cm ³)	Stratum B soil air-filled porosity, θ_a^B (cm ³ /cm ³)	Stratum C soil air-filled porosity, θ_a^C (cm ³ /cm ³)	Stratum A effective total fluid saturation, S_{ie} (cm ³ /cm ³)	Stratum A soil intrinsic permeability, k_i (cm ²)	Stratum A soil relative air permeability, k_{ra} (cm ²)	Stratum A soil effective vapor permeability, k_v (cm ²)	Thickness of capillary zone, L_{cz} (cm)	Total porosity in capillary zone, n_{cz} (cm ³ /cm ³)	Air-filled porosity in capillary zone, $\theta_{a,cz}$ (cm ³ /cm ³)	Water-filled porosity in capillary zone, $\theta_{w,cz}$ (cm ³ /cm ³)	Floor-wall seam perimeter, X_{crack} (cm)
7.88E+08	285	0.130	0.260	#VALUE!	0.592	1.48E-09	0.601	8.91E-10	192.31	0.43	0.006	0.424	4,000

Bldg. ventilation rate, $Q_{building}$ (cm ³ /s)	Area of enclosed space below grade, A_B (cm ²)	Crack-to-total area ratio, η (unitless)	Crack depth below grade, Z_{crack} (cm)	Enthalpy of vaporization at ave. groundwater temperature, $\Delta H_{v,TS}$ (cal/mol)	Henry's law constant at ave. groundwater temperature, H_{TS} (atm-m ³ /mol)	Henry's law constant at ave. groundwater temperature, H'_{TS} (unitless)	Vapor viscosity at ave. soil temperature, μ_{TS} (g/cm-s)	Stratum A effective diffusion coefficient, D_A^{eff} (cm ² /s)	Stratum B effective diffusion coefficient, D_B^{eff} (cm ² /s)	Stratum C effective diffusion coefficient, D_C^{eff} (cm ² /s)	Capillary zone effective diffusion coefficient, D_{cz}^{eff} (cm ² /s)	Total overall effective diffusion coefficient, D_T^{eff} (cm ² /s)	Diffusion path length, L_d (cm)
5.63E+04	1.00E+06	4.00E-04	15	8,557	4.78E-03	2.06E-01	1.75E-04	4.83E-04	0.00E+00	0.00E+00	1.37E-05	2.01E-05	285

Convection path length, L_p (cm)	Source vapor conc., C_{source} (µg/m ³)	Crack radius, r_{crack} (cm)	Average vapor flow rate into bldg., Q_{soil} (cm ³ /s)	Crack effective diffusion coefficient, D^{crack} (cm ² /s)	Area of crack, A_{crack} (cm ²)	Exponent of equivalent foundation Peclet number, $\exp(Pe^f)$ (unitless)	Infinite source indoor attenuation coefficient, α (unitless)	Infinite source bldg. conc., $C_{building}$ (µg/m ³)	Unit risk factor, URF (µg/m ³) ⁻¹	Reference conc., RfC (mg/m ³)
15	7.20E+02	0.10	8.96E-01	4.83E-04	4.00E+02	1.54E+30	1.16E-06	8.35E-04	1.1E-05	4.0E-02

END

RESULTS SHEET FOR QAS Ind_GWtoAir-TCE(UB)_07
OFF-SITE AREA 1
QAS Site

RISK-BASED GROUNDWATER CONCENTRATION CALCULATIONS:

Indoor exposure groundwater conc., carcinogen (µg/L)	Indoor exposure groundwater conc., noncarcinogen (µg/L)	Risk-based indoor exposure groundwater conc., (µg/L)	Pure component water solubility, S (µg/L)	Final indoor exposure groundwater conc., (µg/L)
NA	NA	NA	1.47E+06	NA

INCREMENTAL RISK CALCULATIONS:

Incremental risk from vapor intrusion to indoor air, carcinogen (unitless)	Hazard quotient from vapor intrusion to indoor air, noncarcinogen (unitless)
2.0E-08	1.3E-05

MESSAGE AND ERROR SUMMARY BELOW: (DO NOT USE RESULTS IF ERRORS ARE PRESENT)

MESSAGE: Risk/HQ or risk-based groundwater concentration is based on a route-to-route extrapolation.

SCROLL
DOWN
TO "END"

END

Used to calculate risk-based groundwater concentration.

CHEMICAL PROPERTIES FOR QAS Ind_GWtoAir-TCE(UB)_07
Off-Site Area 1

Diffusivity in air, D_a (cm ² /s)	Diffusivity in water, D_w (cm ² /s)	Henry's law constant at reference temperature, H (atm-m ³ /mol)	Henry's law constant reference temperature, T_R (°C)	Enthalpy of vaporization at the normal boiling point, $\Delta H_{v,b}$ (cal/mol)	Normal boiling point, T_B (°K)	Critical temperature, T_C (°K)	Organic carbon partition coefficient, K_{oc} (cm ³ /g)	Pure component water solubility, S (mg/L)	Unit risk factor, URF (µg/m ³) ⁻¹	Reference conc., RfC (mg/m ³)
7.90E-02	9.10E-06	1.03E-02	25	7,505	360.36	544.20	1.66E+02	1.47E+03	1.1E-04	4.0E-02

END

INTERMEDIATE CALCULATIONS SHEET FOR
QAS Ind_GWtoAir-TCE(UB)_07
Off-Site Area 1

Exposure duration, τ (sec)	Source-building separation, L_T (cm)	Stratum A soil air-filled porosity, θ_a^A (cm ³ /cm ³)	Stratum B soil air-filled porosity, θ_a^B (cm ³ /cm ³)	Stratum C soil air-filled porosity, θ_a^C (cm ³ /cm ³)	Stratum A effective total fluid saturation, S_{t0} (cm ³ /cm ³)	Stratum A soil intrinsic permeability, k_i (cm ²)	Stratum A soil relative air permeability, k_{ra} (cm ²)	Stratum A soil effective vapor permeability, k_v (cm ²)	Thickness of capillary zone, L_{cz} (cm)	Total porosity in capillary zone, n_{cz} (cm ³ /cm ³)	Air-filled porosity in capillary zone, $\theta_{a,cz}$ (cm ³ /cm ³)	Water-filled porosity in capillary zone, $\theta_{w,cz}$ (cm ³ /cm ³)	Floor-wall seam perimeter, X_{crack} (cm)
7.88E+08	285	0.130	0.260	#VALUE!	0.592	1.48E-09	0.601	8.91E-10	192.31	0.43	0.006	0.424	4,000

Bldg. ventilation rate, $Q_{building}$ (cm ³ /s)	Area of enclosed space below grade, A_B (cm ²)	Crack-to-total area ratio, η (unitless)	Crack depth below grade, Z_{crack} (cm)	Enthalpy of vaporization at ave. groundwater temperature, $\Delta H_{v,TS}$ (cal/mol)	Henry's law constant at ave. groundwater temperature, H_{TS} (atm-m ³ /mol)	Henry's law constant at ave. groundwater temperature, H'_{TS} (unitless)	Vapor viscosity at ave. soil temperature, μ_{TS} (g/cm-s)	Stratum A effective diffusion coefficient, D^{eff}_A (cm ² /s)	Stratum B effective diffusion coefficient, D^{eff}_B (cm ² /s)	Stratum C effective diffusion coefficient, D^{eff}_C (cm ² /s)	Capillary zone effective diffusion coefficient, D^{eff}_{cz} (cm ² /s)	Total overall effective diffusion coefficient, D^{eff}_T (cm ² /s)	Diffusion path length, L_d (cm)
5.63E+04	1.00E+06	4.00E-04	15	8,557	4.78E-03	2.06E-01	1.75E-04	4.83E-04	0.00E+00	0.00E+00	1.37E-05	2.01E-05	285

Convection path length, L_p (cm)	Source vapor conc., C_{source} (µg/m ³)	Crack radius, r_{crack} (cm)	Average vapor flow rate into bldg., Q_{soil} (cm ³ /s)	Crack effective diffusion coefficient, D^{crack} (cm ² /s)	Area of crack, A_{crack} (cm ²)	Exponent of equivalent foundation Peclet number, $exp(Pe^f)$ (unitless)	Infinite source indoor attenuation coefficient, α (unitless)	Infinite source bldg. conc., $C_{building}$ (µg/m ³)	Unit risk factor, URF (µg/m ³) ⁻¹	Reference conc., RfC (mg/m ³)
15	7.20E+02	0.10	8.96E-01	4.83E-04	4.00E+02	1.54E+30	1.16E-06	8.35E-04	1.1E-04	4.0E-02

END

RESULTS SHEET FOR QAS Ind_GWtoAir-VC_07
OFF-SITE AREA 1
QAS Site

RISK-BASED GROUNDWATER CONCENTRATION CALCULATIONS:

Indoor exposure groundwater conc., carcinogen (µg/L)	Indoor exposure groundwater conc., noncarcinogen (µg/L)	Risk-based indoor exposure groundwater conc., (µg/L)	Pure component water solubility, S (µg/L)	Final indoor exposure groundwater conc., (µg/L)
NA	NA	NA	8.80E+06	NA

INCREMENTAL RISK CALCULATIONS:

Incremental risk from vapor intrusion to indoor air, carcinogen (unitless)	Hazard quotient from vapor intrusion to indoor air, noncarcinogen (unitless)
4.4E-08	1.4E-04

MESSAGE AND ERROR SUMMARY BELOW: (DO NOT USE RESULTS IF ERRORS ARE PRESENT)

SCROLL
DOWN
TO "END"

END

GW-ADV
Version 3.0; 02/03

Reset to
Defaults

CALCULATE RISK-BASED GROUNDWATER CONCENTRATION (enter "X" in "YES" box)

YES

OR

CALCULATE INCREMENTAL RISKS FROM ACTUAL GROUNDWATER CONCENTRATION (enter "X" in "YES" box and initial groundwater conc. below)

YES

X

ENTER Chemical CAS No. (numbers only, no dashes)		ENTER Initial groundwater conc., C_w ($\mu\text{g/L}$)		Chemical							
75014		6.60E+01		Vinyl chloride (chloroethene)							
ENTER Average soil/ groundwater temperature, T_s ($^{\circ}\text{C}$)	ENTER Depth below grade to bottom of enclosed space floor, L_F (cm)	ENTER Depth below grade to water table, L_{WT} (cm)	ENTER Thickness of soil stratum A, h_A (cm)	ENTER Thickness of soil stratum B, (Enter value or 0) h_B (cm)	ENTER Thickness of soil stratum C, (Enter value or 0) h_C (cm)	ENTER Soil stratum directly above water table, (Enter A, B, or C)	ENTER SCS soil type directly above water table	ENTER Soil stratum A SCS soil type (used to estimate soil vapor permeability)	OR	ENTER User-defined stratum A soil vapor permeability, k_v (cm^2)	
10	15	300	300	0	0	A	SIC	SIC			
ENTER Stratum A SCS soil type Lookup Soil Parameters	ENTER Stratum A soil dry bulk density, ρ_b^A (g/cm^3)	ENTER Stratum A soil total porosity, n^A (unitless)	ENTER Stratum A soil water-filled porosity, θ_w^A (cm^3/cm^3)	ENTER Stratum B SCS soil type Lookup Soil Parameters	ENTER Stratum B soil dry bulk density, ρ_b^B (g/cm^3)	ENTER Stratum B soil total porosity, n^B (unitless)	ENTER Stratum B soil water-filled porosity, θ_w^B (cm^3/cm^3)	ENTER Stratum C SCS soil type Lookup Soil Parameters	ENTER Stratum C soil dry bulk density, ρ_b^C (g/cm^3)	ENTER Stratum C soil total porosity, n^C (unitless)	ENTER Stratum C soil water-filled porosity, θ_w^C (cm^3/cm^3)
SIC	1.5	0.43	0.3	SIC	1.7	0.43	0.17		Error	Error	Error
ENTER Enclosed space floor thickness, L_{crack} (cm)	ENTER Soil-bldg. pressure differential, ΔP ($\text{g/cm} \cdot \text{s}^2$)	ENTER Enclosed space floor length, L_B (cm)	ENTER Enclosed space floor width, W_B (cm)	ENTER Enclosed space height, H_B (cm)	ENTER Floor-wall seam crack width, w (cm)	ENTER Indoor air exchange rate, ER (1/h)	ENTER Average vapor flow rate into bldg. OR Leave blank to calculate Q_{soil} (L/m)				
15	40	1000	1000	244	0.1	0.83					
ENTER Averaging time for carcinogens, AT_C (yrs)	ENTER Averaging time for noncarcinogens, AT_{NC} (yrs)	ENTER Exposure duration, ED (yrs)	ENTER Exposure frequency, EF (days/yr)	ENTER Target risk for carcinogens, TR (unitless)	ENTER Target hazard quotient for noncarcinogens, THQ (unitless)						
70	25	25	225	1.0E-06	1						
Used to calculate risk-based groundwater concentration.											

END

DATENTER

CHEMICAL PROPERTIES SHEET FOR QAS Ind_GWtoAir-VC_07
Off-Site Area 1

Diffusivity in air, D_a (cm ² /s)	Diffusivity in water, D_w (cm ² /s)	Henry's law constant at reference temperature, H (atm-m ³ /mol)	Henry's law constant reference temperature, T_R (°C)	Enthalpy of vaporization at the normal boiling point, $\Delta H_{v,b}$ (cal/mol)	Normal boiling point, T_B (°K)	Critical temperature, T_C (°K)	Organic carbon partition coefficient, K_{oc} (cm ³ /g)	Pure component water solubility, S (mg/L)	Unit risk factor, URF (µg/m ³) ⁻¹	Reference conc., RfC (mg/m ³)
1.06E-01	1.23E-05	2.69E-02	25	5,250	259.25	432.00	1.86E+01	8.80E+03	8.8E-06	1.0E-01

END

INTERMEDIATE CALCULATIONS SHEET FOR
QAS Ind_GWtoAir-VC_07
Off-Site Area 1

Exposure duration, τ (sec)	Source-building separation, L_T (cm)	Stratum A soil air-filled porosity, θ_a^A (cm ³ /cm ³)	Stratum B soil air-filled porosity, θ_a^B (cm ³ /cm ³)	Stratum C soil air-filled porosity, θ_a^C (cm ³ /cm ³)	Stratum A effective total fluid saturation, S_{fe} (cm ³ /cm ³)	Stratum A soil intrinsic permeability, k_i (cm ²)	Stratum A soil relative air permeability, k_{ra} (cm ²)	Stratum A soil effective vapor permeability, k_v (cm ²)	Thickness of capillary zone, L_{cz} (cm)	Total porosity in capillary zone, n_{cz} (cm ³ /cm ³)	Air-filled porosity in capillary zone, $\theta_{a,cz}$ (cm ³ /cm ³)	Water-filled porosity in capillary zone, $\theta_{w,cz}$ (cm ³ /cm ³)	Floor-wall seam perimeter, X_{crack} (cm)
---------------------------------------	--	--	--	--	--	---	---	---	--	--	--	--	---

7.88E+08	285	0.130	0.260	#VALUE!	0.592	1.48E-09	0.601	8.91E-10	192.31	0.43	0.006	0.424	4,000
----------	-----	-------	-------	---------	-------	----------	-------	----------	--------	------	-------	-------	-------

Bldg. ventilation rate, $Q_{building}$ (cm ³ /s)	Area of enclosed space below grade, A_B (cm ²)	Crack-to-total area ratio, η (unitless)	Crack depth below grade, Z_{crack} (cm)	Enthalpy of vaporization at ave. groundwater temperature, $\Delta H_{v,TS}$ (cal/mol)	Henry's law constant at ave. groundwater temperature, H_{TS} (atm-m ³ /mol)	Henry's law constant at ave. groundwater temperature, H'_{TS} (unitless)	Vapor viscosity at ave. soil temperature, μ_{TS} (g/cm-s)	Stratum A effective diffusion coefficient, D_A^{eff} (cm ² /s)	Stratum B effective diffusion coefficient, D_B^{eff} (cm ² /s)	Stratum C effective diffusion coefficient, D_C^{eff} (cm ² /s)	Capillary zone effective diffusion coefficient, D_{cz}^{eff} (cm ² /s)	Total overall effective diffusion coefficient, D_T^{eff} (cm ² /s)	Diffusion path length, L_d (cm)
---	--	--	---	---	--	--	---	---	---	---	---	---	---

5.63E+04	1.00E+06	4.00E-04	15	5,000	1.72E-02	7.41E-01	1.75E-04	6.44E-04	0.00E+00	0.00E+00	5.17E-06	7.63E-06	285
----------	----------	----------	----	-------	----------	----------	----------	----------	----------	----------	----------	----------	-----

Convection path length, L_p (cm)	Source vapor conc., C_{source} (μg/m ³)	Crack radius, r_{crack} (cm)	Average vapor flow rate into bldg., Q_{soil} (cm ³ /s)	Crack effective diffusion coefficient, D^{crack} (cm ² /s)	Area of crack, A_{crack} (cm ²)	Exponent of equivalent foundation Peclet number, $\exp(Pe^f)$ (unitless)	Infinite source indoor attenuation coefficient, α (unitless)	Infinite source bldg. conc., $C_{building}$ (μg/m ³)	Unit risk factor, URF (μg/m ³) ⁻¹	Reference conc., RfC (mg/m ³)
--	---	--------------------------------------	---	---	---	--	---	--	--	---

15	4.89E+04	0.10	8.96E-01	6.44E-04	4.00E+02	4.42E+22	4.62E-07	2.26E-02	8.8E-06	1.0E-01
----	----------	------	----------	----------	----------	----------	----------	----------	---------	---------

END

RESULTS SHEET FOR QAS OFSA1 Soil-Air_1122TCAI_SL-ADV-Feb04

Off-site Area 1

QAS Site

Blue Summit, MO

RISK-BASED SOIL CONCENTRATION CALCULATIONS:

INCREMENTAL RISK CALCULATIONS:

Indoor exposure soil conc., carcinogen (µg/kg)	Indoor exposure soil conc., noncarcinogen (µg/kg)	Risk-based indoor exposure soil conc., (µg/kg)	Soil saturation conc., C _{sat} (µg/kg)	Final indoor exposure soil conc., (µg/kg)	Incremental risk from vapor intrusion to indoor air, carcinogen (unitless)	Hazard quotient from vapor intrusion to indoor air, noncarcinogen (unitless)
NA	NA	NA	2.25E+06	NA	1.0E-10	2.3E-08

MESSAGE AND ERROR SUMMARY BELOW: (DO NOT USE RESULTS IF ERRORS ARE PRESENT)

MESSAGE: Risk/HQ or risk-based soil concentration is based on a route-to-route extrapolation.

SCROLL
DOWN
TO "END"

END

DATA ENTRY SHEET FOR QAS OFSA1 Soil-Air_1122TCAI_SL-ADV-Feb04
Off-Site Area 1
QAS Site
Blue Summit, MO

SL-ADV
Version 3.1; 02/04

Reset to
Defaults

CALCULATE RISK-BASED SOIL CONCENTRATION (enter "X" in "YES" box)

YES

OR

CALCULATE INCREMENTAL RISKS FROM ACTUAL SOIL CONCENTRATION (enter "X" in "YES" box and initial soil conc. below)

YES

X

ENTER
Chemical
CAS No.
(numbers only,
no dashes)

ENTER
Initial
soil
conc.,
 C_R
($\mu\text{g/kg}$)

Chemical

79345

3.90E-03

1,1,2,2-Tetrachloroethane

MORE
↓

ENTER Average soil temperature, T_s (°C)	ENTER Depth below grade to bottom of enclosed space floor, L_F (cm)	ENTER Depth below grade to top of contamination, L_1 (cm)	ENTER Depth below grade to bottom of contamination, (enter value of 0 if value is unknown) L_b (cm)	ENTER Thickness of soil stratum A, h_A (cm)	ENTER Thickness of soil stratum B, (Enter value or 0) h_B (cm)	ENTER Thickness of soil stratum C, (Enter value or 0) h_C (cm)	ENTER Soil stratum A SCS soil type (used to estimate soil vapor permeability)	OR	ENTER User-defined stratum A soil vapor permeability, k_v (cm^2)
10	15	15	300	15	0	0	SIC		

MORE
↓

ENTER Stratum A SCS soil type Lookup Soil Parameters	ENTER Stratum A soil dry bulk density, ρ_b^A (g/cm^3)	ENTER Stratum A soil total porosity, n^A (unitless)	ENTER Stratum A soil water-filled porosity, θ_w^A (cm^3/cm^3)	ENTER Stratum A soil organic carbon fraction, f_{oc}^A (unitless)	ENTER Stratum B SCS soil type Lookup Soil Parameters	ENTER Stratum B soil dry bulk density, ρ_b^B (g/cm^3)	ENTER Stratum B soil total porosity, n^B (unitless)	ENTER Stratum B soil water-filled porosity, θ_w^B (cm^3/cm^3)	ENTER Stratum B soil organic carbon fraction, f_{oc}^B (unitless)	ENTER Stratum C SCS soil type Lookup Soil Parameters	ENTER Stratum C soil dry bulk density, ρ_b^C (g/cm^3)	ENTER Stratum C soil total porosity, n^C (unitless)	ENTER Stratum C soil water-filled porosity, θ_w^C (cm^3/cm^3)	ENTER Stratum C soil organic carbon fraction, f_{oc}^C (unitless)
SIC	1.5	0.43	0.3	0.006		1.5	0.43		0.002		1.5	0.43		0.002

MORE
↓

ENTER Enclosed space floor thickness, L_{crack} (cm)	ENTER Soil-bldg. pressure differential, ΔP (g/cm-s^2)	ENTER Enclosed space floor length, L_b (cm)	ENTER Enclosed space floor width, W_b (cm)	ENTER Enclosed space height, H_b (cm)	ENTER Floor-wall seam crack width, w (cm)	ENTER Indoor air exchange rate, ER (1/h)	ENTER Average vapor flow rate into bldg. OR Leave blank to calculate Q_{soil} (L/m)
15	40	1000	1000	244	0.1	0.83	5

ENTER Averaging time for carcinogens, AT_c (yrs)	ENTER Averaging time for noncarcinogens, AT_{nc} (yrs)	ENTER Exposure duration, ED (yrs)	ENTER Exposure frequency, EF (days/yr)	ENTER Target risk for carcinogens, TR (unitless)	ENTER Target hazard quotient for noncarcinogens, THQ (unitless)
70	25	25	225	1.0E-06	1

END

Used to calculate risk-based
soil concentration.

CHEMICAL PROPERTIES SHEET FOR QAS OFSA1 Soil-Air_1122TCAL_SL-ADV-Feb04

Off-Site Area 1 - Soil: 1,1,2,2-TCA

QAS Site

Blue Summit, MO

Diffusivity in air, D_a (cm ² /s)	Diffusivity in water, D_w (cm ² /s)	Henry's law constant at reference temperature, H (atm-m ³ /mol)	Henry's law constant reference temperature, T_R (°C)	Enthalpy of vaporization at the normal boiling point, $\Delta H_{v,b}$ (cal/mol)	Normal boiling point, T_B (°K)	Critical temperature, T_C (°K)	Organic carbon partition coefficient, K_{oc} (cm ³ /g)	Pure component water solubility, S (mg/L)	Unit risk factor, URF (µg/m ³) ⁻¹	Reference conc., RfC (mg/m ³)	Physical state at soil temperature, (S,L,G)
7.10E-02	7.90E-06	3.44E-04	25	8,996	419.60	661.15	9.33E+01	2.96E+03	5.8E-05	2.1E-01	L

END

INTERMEDIATE CALCULATIONS SHEET FOR
QAS OFSA1 Soil-Air_1122TCAI_SL-ADV-Feb04
On-Site/Off-Site Area 1 - Soil: 1,1,2,2-TCA

Exposure duration, τ (sec)	Source-building separation, L_T (cm)	Stratum A soil air-filled porosity, θ_a^A (cm ³ /cm ³)	Stratum B soil air-filled porosity, θ_a^B (cm ³ /cm ³)	Stratum C soil air-filled porosity, θ_a^C (cm ³ /cm ³)	Stratum A effective total fluid saturation, S_{le} (cm ³ /cm ³)	Stratum A soil intrinsic permeability, k_i (cm ²)	Stratum A soil relative air permeability, k_{rg} (cm ²)	Stratum A soil effective vapor permeability, k_v (cm ²)	Floor-wall seam perimeter, X_{crack} (cm)	Initial soil concentration used, C_R (µg/kg)	Bldg. ventilation rate, $Q_{building}$ (cm ³ /s)
7.88E+08	1	0.130	ERROR	ERROR	0.592	1.48E-09	0.601	8.91E-10	4,000	3.90E-03	5.63E+04

Area of enclosed space below grade, A_B (cm ²)	Crack-to-total area ratio, η (unitless)	Crack depth below grade, Z_{crack} (cm)	Enthalpy of vaporization at ave. soil temperature, $\Delta H_{v,TS}$ (cal/mol)	Henry's law constant at ave. soil temperature, H_{TS} (atm-m ³ /mol)	Henry's law constant at ave. soil temperature, H'_{TS} (unitless)	Vapor viscosity at ave. soil temperature, μ_{TS} (g/cm-s)	Stratum A effective diffusion coefficient, D_A^{eff} (cm ² /s)	Stratum B effective diffusion coefficient, D_B^{eff} (cm ² /s)	Stratum C effective diffusion coefficient, D_C^{eff} (cm ² /s)	Total overall effective diffusion coefficient, D_T^{eff} (cm ² /s)	Diffusion path length, L_d (cm)	Convection path length, L_p (cm)
1.00E+06	4.00E-04	15	10,540	1.34E-04	5.77E-03	1.75E-04	5.65E-04	0.00E+00	0.00E+00	5.65E-04	1	15

Soil-water partition coefficient, K_d (cm ³ /g)	Source vapor conc., C_{source} (µg/m ³)	Crack radius, r_{crack} (cm)	Average vapor flow rate into bldg., Q_{soil} (cm ³ /s)	Crack effective diffusion coefficient, D_{crack} (cm ² /s)	Area of crack, A_{crack} (cm ²)	Exponent of equivalent foundation Peclet number, $\exp(Pe^f)$ (unitless)	Infinite source indoor attenuation coefficient, α (unitless)	Infinite source bldg. conc., $C_{building}$ (µg/m ³)	Finite source β term (unitless)	Finite source ψ term (sec) ⁻¹	Time for source depletion, τ_D (sec)	Exposure duration > time for source depletion (YES/NO)
5.60E-01	2.96E-02	0.10	8.33E+01	5.65E-04	4.00E+02	#NUM!	NA	NA	7.78E+00	2.86E-06	1.50E+10	NO

Finite source indoor attenuation coefficient, $\langle \alpha \rangle$ (unitless)	Mass limit bldg. conc., $C_{building}$ (µg/m ³)	Finite source bldg. conc., $C_{building}$ (µg/m ³)	Final finite source bldg. conc., $C_{building}$ (µg/m ³)	Unit risk factor, URF (µg/m ³) ⁻¹	Reference conc., RfC (mg/m ³)
2.66E-04	NA	7.89E-06	7.89E-06	5.8E-05	2.1E-01

END

RESULTS SHEET FOR QAS OFSA2 Res_GWtoAir-14Dioxane_07
Off-Site Area 2
QAS Site
Blue Summit, MO

RISK-BASED GROUNDWATER CONCENTRATION CALCULATIONS:

Indoor exposure groundwater conc., carcinogen (µg/L)	Indoor exposure groundwater conc., noncarcinogen (µg/L)	Risk-based indoor exposure groundwater conc., (µg/L)	Pure component water solubility, S (µg/L)	Final indoor exposure groundwater conc., (µg/L)
NA	NA	NA	1.00E+09	NA

INCREMENTAL RISK CALCULATIONS:

Incremental risk from vapor intrusion to indoor air, carcinogen (unitless)	Hazard quotient from vapor intrusion to indoor air, noncarcinogen (unitless)
6.2E-10	6.2E-08

MESSAGE AND ERROR SUMMARY BELOW: (DO NOT USE RESULTS IF ERRORS ARE PRESENT)

SCROLL
DOWN
TO "END"

END

GROUNDWATER TO INDOOR AIR SUMMARY SHEET FOR QAS OFSA2 Res_GWtoAir-14Dioxane_07
Off-Site Area 2 - QAS Site

GW-ADV
Version 3.0; 02/03

Reset to
Defaults

CALCULATE RISK-BASED GROUNDWATER CONCENTRATION (enter "X" in "YES" box)

YES

OR

CALCULATE INCREMENTAL RISKS FROM ACTUAL GROUNDWATER CONCENTRATION (enter "X" in "YES" box and initial groundwater conc. below)

YES

X

ENTER Chemical CAS No. (numbers only, no dashes)		ENTER Initial groundwater conc., C_W ($\mu\text{g/L}$)		Chemical																			
123911		6.10E+01		1,4-Dioxane																			
ENTER Average soil/ groundwater temperature, T_s ($^{\circ}\text{C}$)		ENTER Depth below grade to bottom of enclosed space floor, L_F (cm)		ENTER Depth below grade to water table, L_{WT} (cm)		ENTER Totals must add up to value of L_{WT} (cell G28) Thickness of soil stratum A, h_A (cm)		ENTER Thickness of soil stratum B, (Enter value or 0) h_B (cm)		ENTER Thickness of soil stratum C, (Enter value or 0) h_C (cm)		ENTER Soil stratum directly above water table, (Enter A, B, or C)		ENTER SCS soil type directly above water table		ENTER Soil stratum A SCS soil type (used to estimate soil vapor permeability)		OR		ENTER User-defined stratum A soil vapor permeability, k_v (cm^2)			
10		15		300		300		0		0		A		SIC		SIC							
ENTER Stratum A SCS soil type Lookup Soil Parameters		ENTER Stratum A soil dry bulk density, ρ_b^A (g/cm^3)		ENTER Stratum A soil total porosity, n^A (unitless)		ENTER Stratum A soil water-filled porosity, θ_w^A (cm^3/cm^3)		ENTER Stratum B SCS soil type Lookup Soil Parameters		ENTER Stratum B soil dry bulk density, ρ_b^B (g/cm^3)		ENTER Stratum B soil total porosity, n^B (unitless)		ENTER Stratum B soil water-filled porosity, θ_w^B (cm^3/cm^3)		ENTER Stratum C SCS soil type Lookup Soil Parameters		ENTER Stratum C soil dry bulk density, ρ_b^C (g/cm^3)		ENTER Stratum C soil total porosity, n^C (unitless)		ENTER Stratum C soil water-filled porosity, θ_w^C (cm^3/cm^3)	
SIC		1.5		0.43		0.3		SIC		1.7		0.43		0.17				Error		Error		Error	
ENTER Enclosed space floor thickness, L_{crack} (cm)		ENTER Soil-bldg. pressure differential, ΔP ($\text{g/cm} \cdot \text{s}^2$)		ENTER Enclosed space floor length, L_B (cm)		ENTER Enclosed space floor width, W_B (cm)		ENTER Enclosed space height, H_B (cm)		ENTER Floor-wall seam crack width, w (cm)		ENTER Indoor air exchange rate, ER (1/h)		ENTER Average vapor flow rate into bldg. OR Leave blank to calculate Q_{soil} (L/m)									
15		40		1000		1000		366		0.1		0.25											
ENTER Averaging time for carcinogens, AT_C (yrs)		ENTER Averaging time for noncarcinogens, AT_{NC} (yrs)		ENTER Exposure duration, ED (yrs)		ENTER Exposure frequency, EF (days/yr)		ENTER Target risk for carcinogens, TR (unitless)		ENTER Target hazard quotient for noncarcinogens, THQ (unitless)													
70		30		30		350		1.0E-06		1													
Used to calculate risk-based groundwater concentration.																							

END

CHEMICAL PROPERTIES SHEET for QAS QFSA2 Res_GWtoAir-14Dioxane_07

Off-Site Area 2

QAS Site

Blue Summit, MO

Diffusivity in air, D_a (cm ² /s)	Diffusivity in water, D_w (cm ² /s)	Henry's law constant at reference temperature, H (atm-m ³ /mol)	Henry's law constant reference temperature, T_R (°C)	Enthalpy of vaporization at the normal boiling point, $\Delta H_{v,b}$ (cal/mol)	Normal boiling point, T_B (°K)	Critical temperature, T_C (°K)	Organic carbon partition coefficient, K_{oc} (cm ³ /g)	Pure component water solubility, S (mg/L)	Unit risk factor, URF (µg/m ³) ⁻¹	Reference conc., RfC (mg/m ³)
2.30E-01	1.00E-05	4.80E-06	25	8,687	374.25	585.15	1.70E+01	1.00E+06	7.7E-06	3.0E+00

END

INTERMEDIATE CALCULATIONS SHEET FOR
QAS OFSA2 Res_GWtoAir-14Dioxane_07
Off-Site Area 2 Groundwater

Exposure duration, τ (sec)	Source-building separation, L_T (cm)	Stratum A soil air-filled porosity, θ_a^A (cm ³ /cm ³)	Stratum B soil air-filled porosity, θ_a^B (cm ³ /cm ³)	Stratum C soil air-filled porosity, θ_a^C (cm ³ /cm ³)	Stratum A effective total fluid saturation, S_{la} (cm ³ /cm ³)	Stratum A soil intrinsic permeability, k_i (cm ²)	Stratum A soil relative air permeability, k_{ra} (cm ²)	Stratum A soil effective vapor permeability, k_v (cm ²)	Thickness of capillary zone, L_{cz} (cm)	Total porosity in capillary zone, n_{cz} (cm ³ /cm ³)	Air-filled porosity in capillary zone, $\theta_{a,cz}$ (cm ³ /cm ³)	Water-filled porosity in capillary zone, $\theta_{w,cz}$ (cm ³ /cm ³)	Floor-wall seam perimeter, X_{crack} (cm)
---------------------------------------	--	--	--	--	--	---	---	---	--	--	--	--	---

9.46E+08	285	0.130	0.260	#VALUE!	0.592	1.48E-09	0.601	8.91E-10	192.31	0.43	0.006	0.424	4.000
----------	-----	-------	-------	---------	-------	----------	-------	----------	--------	------	-------	-------	-------

Bldg. ventilation rate, $Q_{building}$ (cm ³ /s)	Area of enclosed space below grade, A_B (cm ²)	Crack-to-total area ratio, η (unitless)	Crack depth below grade, Z_{crack} (cm)	Enthalpy of vaporization at ave. groundwater temperature, $\Delta H_{v,TS}$ (cal/mol)	Henry's law constant at ave. groundwater temperature, H_{TS} (atm-m ³ /mol)	Henry's law constant at ave. groundwater temperature, H'_{TS} (unitless)	Vapor viscosity at ave. soil temperature, μ_{TS} (g/cm-s)	Stratum A effective diffusion coefficient, D_A^{eff} (cm ² /s)	Stratum B effective diffusion coefficient, D_B^{eff} (cm ² /s)	Stratum C effective diffusion coefficient, D_C^{eff} (cm ² /s)	Capillary zone effective diffusion coefficient, D_{cz}^{eff} (cm ² /s)	Total overall effective diffusion coefficient, D_T^{eff} (cm ² /s)	Diffusion path length, L_d (cm)
---	--	--	---	---	--	--	---	---	---	---	---	---	---

2.54E+04	1.00E+06	4.00E-04	15	9,876	1.99E-06	8.55E-05	1.75E-04	1.29E-02	0.00E+00	0.00E+00	3.62E-02	2.28E-02	285
----------	----------	----------	----	-------	----------	----------	----------	----------	----------	----------	----------	----------	-----

Convection path length, L_p (cm)	Source vapor conc., C_{source} (µg/m ³)	Crack radius, r_{crack} (cm)	Average vapor flow rate into bldg., Q_{soil} (cm ³ /s)	Crack effective diffusion coefficient, D^{crack} (cm ² /s)	Area of crack, A_{crack} (cm ²)	Exponent of equivalent foundation Peclet number, $\exp(Pe^f)$ (unitless)	Infinite source indoor attenuation coefficient, α (unitless)	Infinite source bldg. conc., $C_{building}$ (µg/m ³)	Unit risk factor, URF (µg/m ³) ⁻¹	Reference conc., RfC (mg/m ³)
--	---	--------------------------------------	---	---	---	--	---	--	--	---

15	5.22E+00	0.10	8.96E-01	1.29E-02	4.00E+02	1.36E+01	3.76E-05	1.96E-04	7.7E-06	3.0E+00
----	----------	------	----------	----------	----------	----------	----------	----------	---------	---------

END

RESULTS SHEET FOR QAS OFSA2 Res_GWtoAir-TCE(LB)_07
OFF-SITE AREA 2 Groundwater to Indoor Air
QAS Site

RISK-BASED GROUNDWATER CONCENTRATION CALCULATIONS:

Indoor exposure groundwater conc., carcinogen (µg/L)	Indoor exposure groundwater conc., noncarcinogen (µg/L)	Risk-based indoor exposure groundwater conc., (µg/L)	Pure component water solubility, S (µg/L)	Final indoor exposure groundwater conc., (µg/L)
NA	NA	NA	1.47E+06	NA

INCREMENTAL RISK CALCULATIONS:

Incremental risk from vapor intrusion to indoor air, carcinogen (unitless)	Hazard quotient from vapor intrusion to indoor air, noncarcinogen (unitless)
2.7E-09	1.4E-05

MESSAGE AND ERROR SUMMARY BELOW: (DO NOT USE RESULTS IF ERRORS ARE PRESENT)

MESSAGE: Risk/HQ or risk-based groundwater concentration is based on a route-to-route extrapolation.

SCROLL
DOWN
TO "END"

END

CHEMICAL PROPERTIES FOR QAS OFSA2 Res_GWtoAir-TCE(LB)_07
Off-site Area 2 Groundwater to Indoor Air

Diffusivity in air, D_a (cm ² /s)	Diffusivity in water, D_w (cm ² /s)	Henry's law constant at reference temperature, H (atm-m ³ /mol)	Henry's law constant reference temperature, T_R (°C)	Enthalpy of vaporization at the normal boiling point, $\Delta H_{v,b}$ (cal/mol)	Normal boiling point, T_B (°K)	Critical temperature, T_C (°K)	Organic carbon partition coefficient, K_{oc} (cm ³ /g)	Pure component water solubility, S (mg/L)	Unit risk factor, URF (µg/m ³) ⁻¹	Reference conc., RfC (mg/m ³)
7.90E-02	9.10E-06	1.03E-02	25	7,505	360.36	544.20	1.66E+02	1.47E+03	1.1E-05	4.0E-02

END

INTERMEDIATE CALCULATIONS SHEET FOR
QAS OFSA2 Res_GWtoAir-TCE(LB)_07
Off-Site Area 2 Groundwater to Indoor Air

Exposure duration, τ (sec)	Source-building separation, L_T (cm)	Stratum A soil air-filled porosity, θ_a^A (cm ³ /cm ³)	Stratum B soil air-filled porosity, θ_a^B (cm ³ /cm ³)	Stratum C soil air-filled porosity, θ_a^C (cm ³ /cm ³)	Stratum A effective total fluid saturation, S_{fe} (cm ³ /cm ³)	Stratum A soil intrinsic permeability, k_i (cm ²)	Stratum A soil relative air permeability, k_{ra} (cm ²)	Stratum A soil effective vapor permeability, k_v (cm ²)	Thickness of capillary zone, L_{cz} (cm)	Total porosity in capillary zone, n_{cz} (cm ³ /cm ³)	Air-filled porosity in capillary zone, $\theta_{a,cz}$ (cm ³ /cm ³)	Water-filled porosity in capillary zone, $\theta_{w,cz}$ (cm ³ /cm ³)	Floor-wall seam perimeter, X_{crack} (cm)
9.46E+08	285	0.130	0.260	#VALUE!	0.592	1.48E-09	0.601	8.91E-10	192.31	0.43	0.006	0.424	4.000

Bldg. ventilation rate, $Q_{building}$ (cm ³ /s)	Area of enclosed space below grade, A_B (cm ²)	Crack-to-total area ratio, η (unitless)	Crack depth below grade, Z_{crack} (cm)	Enthalpy of vaporization at ave. groundwater temperature, $\Delta H_{v,TS}$ (cal/mol)	Henry's law constant at ave. groundwater temperature, H_{TS} (atm-m ³ /mol)	Henry's law constant at ave. groundwater temperature, H'_{TS} (unitless)	Vapor viscosity at ave. soil temperature, μ_{TS} (g/cm-s)	Stratum A effective diffusion coefficient, D_A^{eff} (cm ² /s)	Stratum B effective diffusion coefficient, D_B^{eff} (cm ² /s)	Stratum C effective diffusion coefficient, D_C^{eff} (cm ² /s)	Capillary zone effective diffusion coefficient, D_{cz}^{eff} (cm ² /s)	Total overall effective diffusion coefficient, D_T^{eff} (cm ² /s)	Diffusion path length, L_d (cm)
8.44E+04	1.00E+06	4.00E-04	15	8,557	4.78E-03	2.06E-01	1.75E-04	4.83E-04	0.00E+00	0.00E+00	1.37E-05	2.01E-05	285

Convection path length, L_p (cm)	Source vapor conc., C_{source} (µg/m ³)	Crack radius, r_{crack} (cm)	Average vapor flow rate into bldg., Q_{soil} (cm ³ /s)	Crack effective diffusion coefficient, D_{crack} (cm ² /s)	Area of crack, A_{crack} (cm ²)	Exponent of equivalent foundation Peclet number, $\exp(Pe^f)$ (unitless)	Infinite source indoor attenuation coefficient, α (unitless)	Infinite source bldg. conc., $C_{building}$ (µg/m ³)	Unit risk factor, URF (µg/m ³) ⁻¹	Reference conc., RfC (mg/m ³)
15	7.61E+02	0.10	8.96E-01	4.83E-04	4.00E+02	1.54E+30	7.73E-07	5.89E-04	1.1E-05	4.0E-02

END

RESULTS SHEET FOR QAS OFSA2 Res_GWtoAir-TCE(UB)_07
 OFF-SITE AREA 2 Groundwater to Indoor Air
 QAS Site

RISK-BASED GROUNDWATER CONCENTRATION CALCULATIONS:

Indoor exposure groundwater conc., carcinogen (µg/L)	Indoor exposure groundwater conc., noncarcinogen (µg/L)	Risk-based indoor exposure groundwater conc., (µg/L)	Pure component water solubility, S (µg/L)	Final indoor exposure groundwater conc., (µg/L)
NA	NA	NA	1.47E+06	NA

INCREMENTAL RISK CALCULATIONS:

Incremental risk from vapor intrusion to indoor air, carcinogen (unitless)	Hazard quotient from vapor intrusion to indoor air, noncarcinogen (unitless)
8.8E-08	4.7E-05

MESSAGE AND ERROR SUMMARY BELOW: (DO NOT USE RESULTS IF ERRORS ARE PRESENT)

MESSAGE: Risk/HQ or risk-based groundwater concentration is based on a route-to-route extrapolation.

SCROLL
DOWN
TO "END"

END

GROUNDWATER TO INDOOR AIR SUMMARY SHEET FOR QAS OFSA2 Res_GWtoAir-TCE(UB)_07

GW-ADV
Version 3.0; 02/03Reset to
Defaults

CALCULATE RISK-BASED GROUNDWATER CONCENTRATION (enter "X" in "YES" box)

YES

OR

CALCULATE INCREMENTAL RISKS FROM ACTUAL GROUNDWATER CONCENTRATION (enter "X" in "YES" box and initial groundwater conc. below)

YES

X

ENTER Chemical CAS No. (numbers only, no dashes)		ENTER Initial groundwater conc., C_w ($\mu\text{g/L}$)		Chemical							
79016		3.70E+00		Trichloroethylene							
ENTER Average soil/ groundwater temperature, T_s ($^{\circ}\text{C}$)		ENTER Depth below grade to bottom of enclosed space floor, L_F (cm)		ENTER Depth below grade to water table, L_{WT} (cm)		ENTER Totals must add up to value of L_{WT} (cell G28) Thickness of soil stratum A, h_A (cm)		ENTER Thickness of soil stratum B, (Enter value or 0) h_B (cm)		ENTER Thickness of soil stratum C, (Enter value or 0) h_C (cm)	
10		15		300		300		0		0	
ENTER Soil stratum directly above water table, (Enter A, B, or C)		ENTER SCS soil type directly above water table		ENTER Soil stratum A SCS soil type (used to estimate soil vapor permeability)		OR		ENTER User-defined stratum A soil vapor permeability, k_v (cm^2)			
A		SIC		SIC							
ENTER Stratum A SCS soil type Lookup Soil Parameters		ENTER Stratum A soil dry bulk density, ρ_b^A (g/cm^3)		ENTER Stratum A soil total porosity, n^A (unitless)		ENTER Stratum A soil water-filled porosity, θ_w^A (cm^3/cm^3)		ENTER Stratum B SCS soil type Lookup Soil Parameters		ENTER Stratum B soil dry bulk density, ρ_b^B (g/cm^3)	
SIC		1.5		0.43		0.3		SIC		1.7	
ENTER Stratum B soil total porosity, n^B (unitless)		ENTER Stratum B soil water-filled porosity, θ_w^B (cm^3/cm^3)		ENTER Stratum C SCS soil type Lookup Soil Parameters		ENTER Stratum C soil dry bulk density, ρ_b^C (g/cm^3)		ENTER Stratum C soil total porosity, n^C (unitless)		ENTER Stratum C soil water-filled porosity, θ_w^C (cm^3/cm^3)	
0.43		0.17				Error		Error		Error	
ENTER Enclosed space floor thickness, L_{crack} (cm)		ENTER Soil-bldg. pressure differential, ΔP ($\text{g/cm} \cdot \text{s}^2$)		ENTER Enclosed space floor length, L_g (cm)		ENTER Enclosed space floor width, W_B (cm)		ENTER Enclosed space height, H_B (cm)		ENTER Floor-wall seam crack width, w (cm)	
15		40		1000		1000		366		0.1	
ENTER Indoor air exchange rate, ER (1/h)		ENTER Average vapor flow rate into bldg. OR Leave blank to calculate Q_{soil} (L/m)									
0.25											
ENTER Averaging time for carcinogens, AT_c (yrs)		ENTER Averaging time for noncarcinogens, AT_{nc} (yrs)		ENTER Exposure duration, ED (yrs)		ENTER Exposure frequency, EF (days/yr)		ENTER Target risk for carcinogens, TR (unitless)		ENTER Target hazard quotient for noncarcinogens, THQ (unitless)	
70		30		30		350		1.0E-06		1	
END											

Used to calculate risk-based groundwater concentration.

CHEMICAL PROPERTIES FOR QAS OFSA2 Res_GWtoAir-TCE(UB)_07
Off-Site Area 2 Groundwater to Indoor Air

Diffusivity in air, D_a (cm ² /s)	Diffusivity in water, D_w (cm ² /s)	Henry's law constant at reference temperature, H (atm-m ³ /mol)	Henry's law constant reference temperature, T_R (°C)	Enthalpy of vaporization at the normal boiling point, $\Delta H_{v,b}$ (cal/mol)	Normal boiling point, T_B (°K)	Critical temperature, T_C (°K)	Organic carbon partition coefficient, K_{oc} (cm ³ /g)	Pure component water solubility, S (mg/L)	Unit risk factor, URF (µg/m ³) ⁻¹	Reference conc., RfC (mg/m ³)
7.90E-02	9.10E-06	1.03E-02	25	7,505	360.36	544.20	1.66E+02	1.47E+03	1.1E-04	4.0E-02

END

INTERMEDIATE CALCULATIONS SHEET FOR
QAS OFSA2 Res_GWtoAir-TCE(UB)_07
Off-Site Area 2 Groundwater to Indoor Air

Exposure duration, τ (sec)	Source-building separation, L_T (cm)	Stratum A soil air-filled porosity, θ_a^A (cm ³ /cm ³)	Stratum B soil air-filled porosity, θ_a^B (cm ³ /cm ³)	Stratum C soil air-filled porosity, θ_a^C (cm ³ /cm ³)	Stratum A effective total fluid saturation, S_{ie} (cm ³ /cm ³)	Stratum A soil intrinsic permeability, k_i (cm ²)	Stratum A soil relative air permeability, k_{ra} (cm ²)	Stratum A soil effective vapor permeability, k_v (cm ²)	Thickness of capillary zone, L_{cz} (cm)	Total porosity in capillary zone, n_{cz} (cm ³ /cm ³)	Air-filled porosity in capillary zone, $\theta_{a,cz}$ (cm ³ /cm ³)	Water-filled porosity in capillary zone, $\theta_{w,cz}$ (cm ³ /cm ³)	Floor-wall seam perimeter, X_{crack} (cm)
9.48E+08	285	0.130	0.260	#VALUE!	0.592	1.48E-09	0.601	8.91E-10	192.31	0.43	0.006	0.424	4,000

Bldg. ventilation rate, Q_{building} (cm^3/s)	Area of enclosed space below grade, A_B (cm^2)	Crack- to-total area ratio, η (unitless)	Crack depth below grade, Z_{crack} (cm)	Enthalpy of vaporization at ave. groundwater temperature, $\Delta H_{v,TS}$ (cal/mol)	Henry's law constant at ave. groundwater temperature, H_{TS} (atm-m ³ /mol)	Henry's law constant at ave. groundwater temperature, H'_{TS} (unitless)	Vapor viscosity at ave. soil temperature, μ_{TS} (g/cm-s)	Stratum A effective diffusion coefficient, D^{eff}_A (cm^2/s)	Stratum B effective diffusion coefficient, D^{eff}_B (cm^2/s)	Stratum C effective diffusion coefficient, D^{eff}_C (cm^2/s)	Capillary zone effective diffusion coefficient, D^{eff}_{cz} (cm^2/s)	Total overall effective diffusion coefficient, D^{eff}_T (cm^2/s)	Diffusion path length, L_d (cm)
2.54E+04	1.00E+06	4.00E-04	15	8,557	4.78E-03	2.06E-01	1.75E-04	4.83E-04	0.00E+00	0.00E+00	1.37E-05	2.01E-05	285

Convection path length, L_p (cm)	Source vapor conc., C_{source} ($\mu\text{g}/\text{m}^3$)	Crack radius, r_{crack} (cm)	Average vapor flow rate into bldg., Q_{gall} (cm^3/s)	Crack effective diffusion coefficient, D^{crack} (cm^2/s)	Area of crack, A_{crack} (cm^2)	Exponent of equivalent Peclet number, $\exp(\text{Pe}')$ (unitless)	Infinite source indoor attenuation coefficient, α (unitless)	Infinite source bldg. conc., $C_{building}$ ($\mu\text{g}/\text{m}^3$)	Unit risk factor, URF ($\mu\text{g}/\text{m}^3$) ⁻¹	Reference conc., RfC (mg/m^3)
15	7.61E+02	0.10	8.96E-01	4.83E-04	4.00E+02	1.54E+30	2.57E-06	1.95E-03	1.1E-04	4.0E-02

END

RESULTS SHEET FOR QAS OFSA2 Res_GWtoAir-VC_07
OFF-SITE AREA 2 Groundwater to Indoor Air
QAS Site

RISK-BASED GROUNDWATER CONCENTRATION CALCULATIONS:

Indoor exposure groundwater conc., carcinogen (µg/L)	Indoor exposure groundwater conc., noncarcinogen (µg/L)	Risk-based indoor exposure groundwater conc., (µg/L)	Pure component water solubility, S (µg/L)	Final indoor exposure groundwater conc., (µg/L)
NA	NA	NA	8.80E+06	NA

INCREMENTAL RISK CALCULATIONS:

Incremental risk from vapor intrusion to indoor air, carcinogen (unitless)	Hazard quotient from vapor intrusion to indoor air, noncarcinogen (unitless)
3.6E-09	9.4E-06

MESSAGE AND ERROR SUMMARY BELOW: (DO NOT USE RESULTS IF ERRORS ARE PRESENT)

SCROLL
DOWN
TO "END"

END

GW-ADV
Version 3.0; 02/03Reset to
Defaults

CALCULATE RISK-BASED GROUNDWATER CONCENTRATION (enter "X" in "YES" box)

YES

OR

CALCULATE INCREMENTAL RISKS FROM ACTUAL GROUNDWATER CONCENTRATION (enter "X" in "YES" box and initial groundwater conc. below)

YES

X

ENTER Chemical CAS No. (numbers only, no dashes)		ENTER Initial groundwater conc., C_w ($\mu\text{g/L}$)		Chemical							
75014		1.30E+00		Vinyl chloride (chloroethene)							
ENTER Average soil/ groundwater temperature, T_s ($^{\circ}\text{C}$)		ENTER Depth below grade to bottom of enclosed space floor, L_F (cm)		ENTER Depth below grade to water table, L_{WT} (cm)		ENTER Thickness of soil stratum A, h_A (cm)		ENTER Thickness of soil stratum B, (Enter value or 0) h_B (cm)		ENTER Thickness of soil stratum C, (Enter value or 0) h_C (cm)	
10		15		300		300		0		0	
ENTER Soil stratum directly above water table, (Enter A, B, or C)		ENTER SCS soil type directly above water table		ENTER Soil stratum A SCS soil type (used to estimate soil vapor permeability)		OR		ENTER User-defined stratum A soil vapor permeability, k_v (cm^2)			
A		SIC		SIC							
ENTER Stratum A SCS soil type Lookup Soil Parameters		ENTER Stratum A soil dry bulk density, ρ_b^A (g/cm^3)		ENTER Stratum A soil total porosity, n^A (unitless)		ENTER Stratum A soil water-filled porosity, θ_w^A (cm^3/cm^3)		ENTER Stratum B SCS soil type Lookup Soil Parameters		ENTER Stratum B soil dry bulk density, ρ_b^B (g/cm^3)	
SIC		1.5		0.43		0.3		SIC		1.7	
ENTER Stratum B soil total porosity, n^B (unitless)		ENTER Stratum B soil water-filled porosity, θ_w^B (cm^3/cm^3)		ENTER Stratum C SCS soil type Lookup Soil Parameters		ENTER Stratum C soil dry bulk density, ρ_b^C (g/cm^3)		ENTER Stratum C soil total porosity, n^C (unitless)		ENTER Stratum C soil water-filled porosity, θ_w^C (cm^3/cm^3)	
0.43		0.17		Error		Error		Error		Error	
ENTER Enclosed space floor thickness, L_{crack} (cm)		ENTER Soil-bldg. pressure differential, ΔP (g/cm^2)		ENTER Enclosed space floor length, L_B (cm)		ENTER Enclosed space floor width, W_B (cm)		ENTER Enclosed space height, H_B (cm)		ENTER Floor-wall seam crack width, w (cm)	
15		40		1000		1000		366		0.1	
ENTER Indoor air exchange rate, ER (1/h)		ENTER Average vapor flow rate into bldg. OR Leave blank to calculate Q_{soil} (L/m)									
0.25											
ENTER Averaging time for carcinogens, AT_C (yrs)		ENTER Averaging time for noncarcinogens, AT_{NC} (yrs)		ENTER Exposure duration, ED (yrs)		ENTER Exposure frequency, EF (days/yr)		ENTER Target risk for carcinogens, TR (unitless)		ENTER Target hazard quotient for noncarcinogens, THQ (unitless)	
70		30		30		350		1.0E-06		1	
								Used to calculate risk-based groundwater concentration.			

END

CHEMICAL PROPERTIES SHEET FOR QAS OFSA2 Res_GWtoAir-VC_07
Off-Site Area 2 Groundwater to Indoor Air

Diffusivity in air, D_a (cm ² /s)	Diffusivity in water, D_w (cm ² /s)	Henry's law constant at reference temperature, H (atm-m ³ /mol)	Henry's law constant reference temperature, T_R (°C)	Enthalpy of vaporization at the normal boiling point, $\Delta H_{v,b}$ (cal/mol)	Normal boiling point, T_B (°K)	Critical temperature, T_C (°K)	Organic carbon partition coefficient, K_{oc} (cm ³ /g)	Pure component water solubility, S (mg/L)	Unit risk factor, URF (µg/m ³) ⁻¹	Reference conc., RfC (mg/m ³)
1.06E-01	1.23E-05	2.69E-02	25	5,250	259.25	432.00	1.86E+01	8.80E+03	8.8E-06	1.0E-01

END

INTERMEDIATE CALCULATIONS SHEET FOR
QAS OFSA2 Res_GWtoAir-VC_07
Off-Site Area 2 Groundwater to Indoor Air

Exposure duration, τ (sec)	Source-building separation, L_T (cm)	Stratum A soil air-filled porosity, θ_a^A (cm ³ /cm ³)	Stratum B soil air-filled porosity, θ_a^B (cm ³ /cm ³)	Stratum C soil air-filled porosity, θ_a^C (cm ³ /cm ³)	Stratum A effective total fluid saturation, S_{fa} (cm ³ /cm ³)	Stratum A soil intrinsic permeability, k_i (cm ²)	Stratum A soil relative air permeability, k_{ra} (cm ²)	Stratum A soil effective vapor permeability, k_v (cm ²)	Thickness of capillary zone, L_{cz} (cm)	Total porosity in capillary zone, n_{cz} (cm ³ /cm ³)	Air-filled porosity in capillary zone, $\theta_{a,cz}$ (cm ³ /cm ³)	Water-filled porosity in capillary zone, $\theta_{w,cz}$ (cm ³ /cm ³)	Floor-wall seam perimeter, X_{crack} (cm)
---------------------------------------	--	--	--	--	--	---	---	---	--	--	--	--	---

9.46E+08	285	0.130	0.260	#VALUE!	0.592	1.48E-09	0.601	8.91E-10	192.31	0.43	0.006	0.424	4,000
----------	-----	-------	-------	---------	-------	----------	-------	----------	--------	------	-------	-------	-------

Bldg. ventilation rate, $Q_{building}$ (cm ³ /s)	Area of enclosed space below grade, A_B (cm ²)	Crack-to-total area ratio, η (unitless)	Crack depth below grade, Z_{crack} (cm)	Enthalpy of vaporization at ave. groundwater temperature, $\Delta H_{v,TS}$ (cal/mol)	Henry's law constant at ave. groundwater temperature, H_{TS} (atm-m ³ /mol)	Henry's law constant at ave. groundwater temperature, H'_{TS} (unitless)	Vapor viscosity at ave. soil temperature, μ_{TS} (g/cm-s)	Stratum A effective diffusion coefficient, D_A^{eff} (cm ² /s)	Stratum B effective diffusion coefficient, D_B^{eff} (cm ² /s)	Stratum C effective diffusion coefficient, D_C^{eff} (cm ² /s)	Capillary zone effective diffusion coefficient, D_{cz}^{eff} (cm ² /s)	Total overall effective diffusion coefficient, D_T^{eff} (cm ² /s)	Diffusion path length, L_d (cm)
---	--	--	---	---	--	--	---	---	---	---	---	---	---

2.54E+04	1.00E+06	4.00E-04	15	5,000	1.72E-02	7.41E-01	1.75E-04	6.44E-04	0.00E+00	0.00E+00	5.17E-06	7.63E-06	285
----------	----------	----------	----	-------	----------	----------	----------	----------	----------	----------	----------	----------	-----

Convection path length, L_p (cm)	Source vapor conc., C_{source} (µg/m ³)	Crack radius, r_{crack} (cm)	Average vapor flow rate into bldg., Q_{soil} (cm ³ /s)	Crack effective diffusion coefficient, D^{crack} (cm ² /s)	Area of crack, A_{crack} (cm ²)	Exponent of equivalent foundation Peclet number, $\exp(Pe^f)$ (unitless)	Infinite source indoor attenuation coefficient, α (unitless)	Infinite source bldg. conc., $C_{building}$ (µg/m ³)	Unit risk factor, URF (µg/m ³) ⁻¹	Reference conc., RfC (mg/m ³)
--	---	--------------------------------------	---	---	---	--	---	--	--	---

15	9.64E+02	0.10	8.96E-01	6.44E-04	4.00E+02	4.42E+22	1.02E-06	9.85E-04	8.8E-06	1.0E-01
----	----------	------	----------	----------	----------	----------	----------	----------	---------	---------

END

APPENDIX G

Domenico Groundwater Fate and Transport Model Calculations

APPENDIX G - Groundwater Modeling Without Active Groundwater Controls Scenario

Introduction

A groundwater fate and transport analysis was conducted to evaluate groundwater conditions and subsequent potential exposures under a scenario of the site without active groundwater controls. This groundwater evaluation consisted of using EPA accepted contaminant fate and transport models to estimate groundwater concentrations downgradient at a potential exposure point or point of exposure (POE). For metals and non-chlorinated volatile organic compounds (benzene, 1,4-dioxane, MTBE), the Domenico Model was used and U.S. EPA's BIOCHLOR Model (version 2.2) was used for modeling chlorinated ethenes (TCE, cis-1,2-DCE, and vinyl chloride). BIOCHLOR is Microsoft Excel-based and models advection and dispersion using the Domenico model and adds a first-order decay biodegradation component to the basic Domenico model.

The nearest point of potential groundwater exposure was conservatively assumed to be at the oxbow, approximately 700 feet downgradient of the excavated source area. COPCs to be evaluated, and source concentrations of these COPCs, were calculated for Offsite Area 1 and for Offsite Area 2 using the 95% upper confidence limit. The distance from Offsite Area 2 to the oxbow is approximately 400 feet. The current channel of the Blue River, located approximately 1,900 feet downgradient of the original source area was also evaluated.

Groundwater is currently not used for any purposes on-site, on MDOT's property west of the site, or on the vacant property between I-435 and the site. Groundwater is not likely to be used on these properties in the future. For purposes of the fate and transport modeling, the distance from the source area to the oxbow was used as the model domain distance.

A groundwater contaminant transport model was used to predict the groundwater concentration at the oxbow. Inherent to this transport model were the following conceptual assumptions:

- The groundwater extraction system is no longer operating.
- Groundwater fate and transport parameters measured before the installation of the extraction system were used to represent hydrogeologic conditions assuming the extraction system was shut-down.
- Following topography, on-site shallow groundwater could potentially migrate to the oxbow. Likewise, groundwater west of the oxbow and Blue River is assumed to flow east toward the low lying river.

Methodology

The modeling was performed using variations on the Domenico model, a three-dimensional analytical transient groundwater contaminant transport model first presented in 1987 by P.A. Domenico as published in the article: "An Analytical Model for Multidimensional Transport of a Decaying Contaminant Species" (J. Hydrology 91, 49-58). The original model and modified models to account for degradation are suggested for use by MDNR to perform calculations for Tier 2 and 3 Risk-Based Target Levels (RBTLs) for groundwater. The models are listed in Appendix E of the MRBCA guidance document.

BIOCHLOR 2.2 is a screening model that simulates remediation by natural attenuation of dissolved chlorinated solvents in groundwater. The software, programmed in the Microsoft Excel spreadsheet environment and based on the Domenico analytical solute transport model, has the ability to simulate one-dimensional advection, three-dimensional dispersion, linear adsorption, and biotransformation via reductive dechlorination (the dominant biotransformation process at most chlorinated solvent sites). Dissolved solvent degradation is assumed to follow a sequential first order decay process. Two different model types were used in the BIOCHLOR simulations, 1) solute transport without decay, and 2) solute transport with biotransformation modeled as a sequential first order decay process. The Biochlor model was used for the chlorinated COPCs: cis-1,2-dichloroethene, trichloroethylene, and vinyl chloride.

The Domenico fate and transport model was run on three non-chlorinated volatile organic compounds and four metals considered to be COPCs at the site prior to installation of the groundwater extraction system. The COPCs were selected based on exceedances of the EPA Region 9 Preliminary Remediation Goals (PRGs) and included 1,4-dioxane, benzene, methyl tert-butyl ether (MTBE), arsenic, cadmium, manganese and lead.

The following equation was used to calculate the concentrations of dissolved COPCs along the centerline of the plume using steady-state attenuation:

$$C_{(x)}/C_{\text{source}} = \exp[(X/2\alpha_x) \times (1 - \sqrt{1 + (4\lambda\alpha_x R/v)})] \times \text{erf}[Y/4\sqrt{\alpha_y} x] \times \text{erf}[Z/2\sqrt{\alpha_z} x]$$

Where: $C_{(x)}$ = the concentration of the chemical at the point of exposure (mg/L)
 C_{source} = the concentration of the chemical at the source area (mg/L)
 X = the distance from the source area to the point of exposure (ft.)
 α_x = the longitudinal groundwater dispersivity (ft.)
 α_y = the transverse groundwater dispersivity (ft.)
 α_z = the vertical groundwater dispersivity (ft.)
 λ = first-order degradation rate (1/day) for chemical
 R = retardation factor
 Y = groundwater source width (ft.)
 Z = groundwater source thickness (ft.)

Appendix G

The groundwater velocity (v) was calculated using the following equation:

$$v = Ki / n_e$$

where, K = the hydraulic conductivity (calculated from a pumping well shut down period in November 2003),
 i = the hydraulic gradient, and
 n_e = the net effective porosity.

The models were run with retardation and an infinite source. Model assumptions and input parameters include the following:

- 1) Source concentrations used were the 95% upper confidence level concentration for the COPCs at the site.
- 2) It was assumed that on-site shallow groundwater potentially migrates toward the former oxbow of the Blue River. The distance from the source area (monitoring well GB-1) to the oxbow is approximately 700 feet from Offsite Area 1 and 400 feet from Offsite Area 2.
- 3) The three-dimensional dispersion values are percentages of the distance to the point of compliance based on MRBCA and EPA recommendations.
- 4) Decay (λ) for 1,4-dioxane and benzene were conservatively set to 0. For metals, there are no published decay terms, therefore a lambda of 0 was assumed.
- 5) The retardation factor was calculated using the K_d , bulk density, and porosity.
- 6) The source width of 233 feet was measured as the width of the excavated source material.
- 7) The source thickness was based on the average thickness of each identified aquifer (A, C, B).
- 8) The hydraulic conductivity of each zone was based on data obtained when pumps were off in November 2003. The data were analyzed as a rising head pump test to calculate hydraulic conductivity conducted at the site in July 2003.
- 9) The gradients in the A, C, and B zones were calculated based on April and November 2006 data from the site.
- 10) The soil bulk density of 1.5 is the MRBCA default value.
- 11) The K_{oc} values were obtained from published MRBCA values.
- 12) The f_{oc} of 0.006 is the MRBCA default value.

Model parameters and chemical-specific parameters are summarized in Tables 4-10 and 4-11, respectively.

Results

BIOCHLOR Modeling – Chlorinated hydrocarbons

Results of the fate and transport modeling are summarized in **Table 4-12a**. BIOCHLOR 2.2 was run on three chlorinated solvents present in groundwater at the site: trichloroethylene (TCE), cis-1,2-dichloroethylene (DCE), and vinyl chloride (VC). Simulations were run for all three aquifer zones (A, C, and B) since each had different hydraulic gradients and aquifer thickness. Each simulation was run for different time periods: 6, 24, and 50 years. The 95% UCL source concentrations in Offsite Area 1 and Offsite Area 2 were different and each of these was used to calculate downgradient concentrations. Downgradient chemical concentrations were calculated for different potential points of exposure including the oxbow and the current Blue River channel.

The A and C zones connect to the surface water channels (i.e., oxbow and Blue River). All downgradient groundwater concentrations were estimated to be non-measurable for all three aquifer zones using a 50-year modeling period.

Domenico Modeling – Non-chlorinated COPCs

Results of the fate and transport modeling are summarized in **Table 4-12b**. The Domenico fate and transport model was run on other COPCs, which included 1,4-dioxane, benzene, MTBE, arsenic, cadmium, manganese, and lead. Source concentrations were different in Offsite Area 1 and Offsite Area 2. Also, benzene and MTBE were not identified COPCs in Offsite Area 2. Benzene was modeled in an anaerobic environment, since ORP and dissolved oxygen concentrations from the site indicate that the groundwater is anaerobic. The decay constant for all 1,4-dioxane and MTBE is generally assumed to be zero, as is the decay constant for benzene under anaerobic conditions. Metals are not assumed to degrade under normal groundwater transport.

Results for each of the three aquifer zones within each Offsite Area were the same, since the second term in the Domenico equation includes the first order degradation rate. The value of the first order degradation rate for each of the compounds is zero and this term of the Domenico equation includes the retardation rate and groundwater velocity. If the degradation rate is zero, the entire second term of the equation becomes zero and therefore there is no difference in the calculated concentrations for each zone since the groundwater velocity and retardation rate terms effectively become zero. However, the source concentrations for each of the Offsite Areas were different, and the Domenico equation calculation resulted in different concentrations at each potential downgradient receptor.

Measurable concentrations of all groundwater COPCs were estimated at each potential downgradient receptor. The maximum modeled groundwater concentrations at the oxbow were used to evaluate human health exposure under the recreational user scenario and ecological risks in the ecological risk assessment.

Uncertainty in the Modeling

There are uncertainties inherent in any modeling process. To address the uncertainties, conservative assumptions were used. Areas of uncertainties are described below.

1. Chemical constituents used in the fate and transport modeling were the 95% upper confidence limit concentrations detected in site groundwater regardless of well location or date. Therefore, this data set does not represent a specific spatial or temporal portrait of site conditions and calibration of the model to known conditions could not be performed. The COPCs selected were based on constituents with maximum detected concentrations that exceeded the Region 9 PRGs.
2. The three-dimensional dispersion distances are calculated as a percentage of the distance to the POE and were not determined using specific site data.
3. Degradation rates and retardation factors were derived from literature values and were not calculated using site-specific chemical concentrations. Site-specific degradation rates and retardation factors were calculated from historical groundwater analytical data, but are influenced by pumping activities and are thought to overestimate the degradation rates as the calculated rates are significantly higher than published literature values.
4. The source width was assumed to be the entire width of the capped and excavated source area. This source has been beheaded and may not represent the size and volume of impacted aquifer material contributing to the groundwater contamination.
5. Gradients calculated for the non-pumping scenario were measured after only 4 days of system shutdown and may not represent the actual gradients that would exist if the system were turned off long enough to reach equilibrium. In order to obtain accurate groundwater gradients, the system would have to be turned off and time would be required for the system to reach equilibrium before measuring water levels in the wells and calculating a new gradient.
6. Soil porosity was a default value and not measured from site soils.
7. Soil bulk density and the fraction of organic carbon were from MRBCA default values and not measured from soil samples collected from the site.
8. Concentrations calculated by the model are in groundwater, and dilution to surface water is not considered in the model calculations.

References

MDNR, 2005. Missouri Risk-Based Corrective Action Technical Guidance, September 2005.

US Air Force Center for Environmental Excellence, 2002. BIOCHLOR Natural Attenuation Decision Support System, Version 2.2, March 2002.

Appendix G

USEPA, 2000, BIOCHLOR Natural Attenuation Decision Support System User's Manual Version 1.0.

USEPA, 2004. EPA Region 9 Preliminary Remediation Goals, online tables, October 2004.

APPENDIX
H

APPENDIX H

Ecological Risk Checklists

**Ecological Risk Assessment
Screening Checklist for Potential Receptors and Habitat
Level 1, Checklist A**

1. Is the site less than ($<$) $\frac{1}{2}$ mile to a surface water resource (pond, river, lake, etc.)?
Yes, the oxbow of the Blue River is located 400 feet west of the site.
2. Are wetlands (e.g., marshes, swamps, fens) on or adjacent to the site?
No.
3. Are contaminated soils uncovered or otherwise accessible to ecological receptors and the elements?
No.
4. Are there karstic features on or within a $\frac{1}{2}$ mile radius of the site?
No.
5. Are the federal or state rare, threatened, or endangered species on or within a $\frac{1}{2}$ mile radius of the site?
No.
6. Are there one or more environmentally sensitive areas at or within a $\frac{1}{2}$ mile radius of the site?
No.
7. Are commercially or recreationally important species (fauna or flora) on or within a $\frac{1}{2}$ mile radius of the site?
No.

If the answer is "yes" to any of the above questions, then complete Ecological Risk Assessment Checklist for Potential Exposure Pathways, Checklist B.

Sources/References:

U.S.G.S. Topographical Quadrangle, 7.5 Series, Independence, MO and Kansas City, MO-KS Maps, 1990.

Heritage Review Report, Missouri Department of Conservation, September 26, 2005.

**Ecological Risk Assessment
Screening Checklist for Potential Receptors and Habitat
Level 1, Checklist B**

- 1.a.) Can contaminants associated with the site leach, dissolve, or otherwise migrate to groundwater?
- 1.b.) Are contaminants associated with the site mobile in groundwater?
- 1.c.) Does groundwater from the site discharge to ecological receptor habitat?

Question 1: Could contaminants associated with the site reach ecological receptors via groundwater?

Downgradient, groundwater migration is controlled by an interceptor trench and extraction wells.

- 2.a.) Is Non-Aqueous Phase Liquid (NAPL) present at the site?
- 2.b.) Is NAPL migrating?
- 2.c.) Could NAPL discharge occur where ecological receptors are found?

Question 2: Could contaminants from the site reach ecological receptors via migration of NAPL?

LNAPL has been detected at the site, however, groundwater/LNAPL migration is controlled by an interceptor trench and groundwater pumping/extraction wells.

- 3.a.) Are contaminants present in surface soils?
 - 3.b.) Can contaminants be leached from or be transported by erosion of surface soils?
- Question 3:** Could contaminants reach ecological receptors via erosional transport of contaminated soils or via precipitation?

No.

- 4.a.) Are contaminants present in surface soils?
 - 4.b.) Are potential ecological receptors on the site?
- Question 4:** Could contaminants reach ecological receptors via direct contact?

No.

- 5.a.) Are contaminants present on the site volatile?
 - 5.b.) Could contaminants on the site be transported in air as dust or particulate matter?
- Question 5:** Could contaminants reach ecological receptors via inhalation of volatilized contaminants or contaminants adhered to dust in ambient air or in subsurface burrows?

No.

- 6.a.) Are contaminants present in surface and shallow subsurface soils or on the surface of the ground?
- 6.b.) Are contaminants present found in soil on the site taken up by plants growing on the site?
- 6.c.) Do potential ecological receptors on or near the site feed on plants (e.g., grasses, shrubs, forbs, trees, etc.) found on the site?
- 6.d.) Do contaminants found on the site bioaccumulate?

Question 6: Could contaminants reach ecological receptors via ingestion of either soil, plants, animals, or contaminants directly?

No.

7.a.) Are there karstic features on or within a ½ mile radius of the site?

7.b.) Is there a hydrogeological connection between the site and the karstic features such as seeps, springs, streams or other surface water bodies?

Question 7: Could contaminants reach ecological receptors via transport through a Karst system?

There are no karstic features on or near the site.

If the answer to one or more of the seven above questions is yes, MDNR may require further assessment to determine whether the site poses an unacceptable risk to ecological receptors.

Sources/References:

U.S.G.S. Topographical Quadrangle, 7.5 Series, Independence, MO and Kansas City, MO-KS Maps, 1990.

Heritage Review Report, Missouri Department of Conservation, September 26, 2005.

APPENDIX

APPENDIX I

Missouri Department of Conservation Information/Correspondence

Shaw Environmental, Inc.

5012 Pikes Peak Road
Ridgeway, Wisconsin 53582
608-924-6500
FAX: 608-924-1163

Shaw® Shaw Environmental, Inc.

September 12, 2005

Endangered Species Coordinator
Missouri Department of Conservation
P.O. Box 180
2901 West Truman Boulevard
Jefferson City, MO 65102-0180

RE: Endangered Species/Natural Communities Request
1633 Marsh Avenue, Blue Summit, Jackson County, Missouri

Dear Sir or Madam:

Shaw Environmental, Inc (Shaw) is conducting an environmental assessment of the property located at 1633 Marsh Avenue, Blue Summit, Missouri in Jackson County. The site is 1.5 acres in size and near an oxbow lake of the Blue River. Figure 1 provides a Site Location Map. Shaw requests any information the Missouri Natural Heritage Program has regarding endangered or threatened species and natural communities of conservation concern on or near the subject site.

We appreciate your assistance. If you need additional information, please call me at 608-924-6500. Thank you.

Sincerely,

Shaw Environmental, Inc.

Laura Tesch
Senior Risk Assessor

Attachment: Figure 1



Heritage Review Report

Missouri Department of Conservation

Policy Coordination Unit

P. O. Box 180

Jefferson City, MO 65102

573-522-4115 X 3250 -- Shannon.Cave@mdc.mo.gov

Ms. Laura Tesch
Shaw Environmental, Inc.
5012 Pikes Peak Road
Ridgeway, Wisconsin 53582

Project type: Environmental Assessment of Property
Location: 1633 Marsh Avenue, Blue Summit, MO
County: Jackson
Date query received: September 21, 2005

This is not a site clearance letter, but a report of Missouri Department of Conservation records concerning public lands and sensitive resources known to be near and possibly affected by the proposed project.

Species/habitats with Federal and State concerns: No Records Found

Species/habitats with State concerns: No Records Found

Prepared by:

26-Sep-05

FEDERAL STATUS is derived from the Endangered Species Act, administered by the U.S. Fish and Wildlife Service. The ESA provides federal protection for plants and animals listed as: E = Endangered, T = Threatened, C = Candidate, PE = Proposed Endangered for Federal listing.

STATE STATUS is either blank or E, for "endangered" as defined in the Wildlife Code of Missouri.

STATE RANKs refer to species tracked but not listed, S1 = Critically imperiled, S2 = Imperiled, S3 = Rare and uncommon or SE = exotic/invasive species.

Concerns & management recommendations based on site or project details, not related to specific heritage records:

Streams in the area should be protected from soil erosion, water pollution and in-stream activities that modify or diminish aquatic habitats. Best management recommendations relating to streams and rivers may be found at <http://www.mdc.mo.gov/documents/nathis/endangered/streams.pdf>

A **HERITAGE REVIEW** provides information about species and habitats of concern that could be affected by the project. Heritage records note things that were positively identified at some date and time, marked at a location that may be more or less precise. Animals move quickly but plant communities can move also. To say "there is a record" does not mean the species/habitat is still there. To say that "there is no record" does not mean the project may not encounter something. Because of this, reports include information about records near but not necessarily on the project site. Three different kinds of information are provided.

- **FEDERAL Concerns** are species/habitats protected under the Federal Endangered Species Act and that have been known near enough to the project site to warrant consideration. For these, project managers must contact the U.S. Fish and Wildlife Service Ecological Services (101 Park Deville Drive Suite A, Columbia, Missouri 65203-0007; Phone 573-234-2132; Fax 573-234-2181) for consultation.
- **STATE Concerns** are species/habitats known to exist near enough to the project site to warrant concern and protected under the Wildlife Code of Missouri (RSMo 3 CSR 10). "State Endangered Status" is determined by the Missouri Conservation Commission under constitutional authority, with requirements expressed in the Missouri Wildlife Code, rule 3CSR10-4.111. "State Rank" is numeric rank of relative rarity, protected under general provisions of the Wildlife Code but not endangered.
- **"Concerns & management recommendations"** are things for which one might prudently look. There is no specific heritage record, but our knowledge of the surrounding landscape suggests consideration. 93% of Missouri's land is in private ownership, so most sites have never been carefully inspected by conservation professionals

This report is not a site clearance letter. Rather, it provides an indication of whether or not public lands and sensitive resources are known to be (or are likely to be) located close to the proposed project. Incorporating information from our Heritage Database into project plans is an important step that can help reduce unnecessary impacts to Missouri's sensitive natural resources. However, the Heritage Database is only one reference that should be used to evaluate potential adverse impacts. Other types of information, such as wetland and soils maps and on-site inspections or surveys, should be considered. Reviewing current landscape and habitat information and species biological characteristics would additionally ensure that species of conservation concern are appropriately identified and addressed.

Additional information on rare, endangered and watched species may be found at <http://www.mdc.mo.gov/nathis/endangered/>. If you would like printed copies of best management practices cited as internet URLs, please contact us.

APPENDIX

J

Appendix J

Site Land Restrictions

**CERTIFICATION OF RECORDING OF A NOTATION ON LAND USE
RESTRICTIONS**

The undersigned hereby certifies that a land use restriction notation was recorded in Book ___, Page ___ of the Jackson County, Missouri, Recorder of Deeds records. That notation pertains to a tract of land (henceforth referred to as the "Land") on parts of Lots 27, 28, 29, 30, and 31, Block 11, RESURVEY OF STARK ACRES, a subdivision in Jackson County, Missouri, also being part of the tract described by trustee deed recorded in Book I-1128, Page 1844, and Missouri Warranty Deeds recorded in Book I-642, Page 1310 and Book I-501, Page 246, of the Jackson County, Missouri Recorder of Deeds. The notation includes the following statement:

The Land has been used to manage hazardous and non-hazardous waste and use of the Land is restricted under 10 Code of State Regulations 25-7.265 effective January 30, 1999. This restriction runs with the Land and binds all current owners and their heirs, successors, executors, and assigns. This notation and the aforementioned survey have been filed in the Office of the Recorder of Deeds for Jackson County, Missouri and with the Director of the Hazardous Waste Program for the Missouri Department of Natural Resources. Information concerning the type, location and quantity of hazardous waste remaining on the Land has been filed with the Jackson County, Missouri Zoning Department, the Director of the Hazardous Waste Program for the Missouri Department of Natural Resources, and the Regional Administrator for the United States Environmental Protection Agency, Region VII.

Subscribed and sworn before me, a
Notary Public in and for Johnson County,
Kansas, this 12 day of January, 2001.

My term expires 8/26, 2002

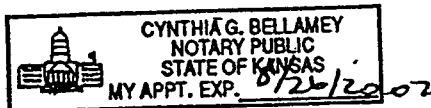
Cynthia A. Bellamey
Print Name: Cynthia G. Bellamey
Notary Public

QUALITY ANALYTICAL SERVICES, INC.
f/k/a Industrial Services Corporation

By:

Ronald D. Deffenbaugh
Ronald D. Deffenbaugh, President

My Commission Expires:



8/26/2002

COPY



2001I 0004387

JACKSON COUNTY DEPARTMENT OF RECORDS
308 WEST KANSAS
INDEPENDENCE, MO 64050

RECORDER OF DEEDS DOCUMENT IDENTIFICATION & CERTIFICATION SHEET

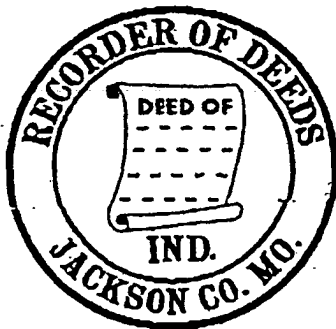
TYPE OF INSTRUMENT PARTIAL PRINCIPALS IDENTIFIED FROM
DOCUMENT FOR DOCUMENT TRACKING PURPOSES
MISC PRUITT JERALD W NONE
BRIEF PROPERTY DESCRIPTION: PT LOTS 27-31 BLOCK 11 RESURVEY OF STARK ACRES

NOTE: Document information on this certification sheet is furnished as a convenience only, and in the case of any discrepancy between same and the attached instrument, the attached instrument governs. The Recorder's official Grantor/Grantee indices are created from the information contained in the actual instrument attached hereto.

STATE OF MISSOURI)
SS.
COUNTY OF JACKSON)

I, the undersigned Recorder of Deeds for said County and State, do hereby certify that the following and annexed instrument of writing, which consists of 3 pages (this page inclusive), was filed for record in my office on the 24 day of January, 2001, at 11:04:41 and is truly recorded as the document number shown at the top and/or bottom of this page.

In witness whereof I have hereunto set my hand and official seal the day, month and year aforesaid.



Fees:	
MO HOUSING TRUST FUND	\$3.00
HOMELESS FEE	\$3.00
RECORDING FEE	\$11.00
STATE USER FEE	\$4.00

Mary H. Murphy

Director of Records
Jackson County, MO

A. Garmon
Recording Deputy

Recording Fee: \$21.00
(Paid at time of Recording)

Return to:

MORRISON & HECKER
2600 GRAND AVENUE
KANSAS CITY, MO 64108-4606

Document Number / Book & Page:
2001I 0004387 (1 - 3)

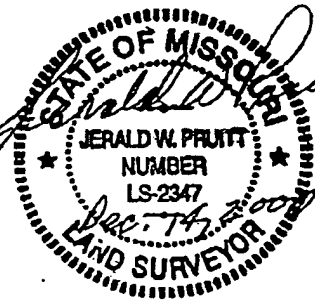
PLEASE DO NOT REMOVE THIS
PAGE FROM THE DOCUMENT

CERTIFICATION OF SURVEYOR

This is to certify that on November 8, 2000 I made a survey for Quality Analytical Services, Inc. of a tract of land located on parts of Lots 27, 28, 29, 30, and 31, Block 11, RESURVEY OF STARK ACRES, a subdivision in Jackson County, Missouri, also being part of the tract described by a trustee deed recorded in Book I-1128, Page 1844, and Missouri Warranty Deeds recorded in Book I-642, Page 1310 and Book I-501, Page 246, of the Jackson County, Missouri, Recorder of Deeds records. 82I 479842 74I 175240
75 I 230624

Due to the unavailability of up-to-date title information, easements and other special conditions affecting this property were not checked.

This survey of urban property was made in accordance with the current Missouri Minimum Standards for Property Boundary Surveys.



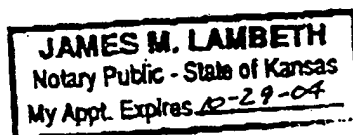
Jerald W. Pruitt
Jerald W. Pruitt
Professional Land Surveyor
PLS #2347

STATE OF Kansas)
COUNTY OF Johnson) ss.

On this 27th day of January, 2001, before me personally appeared Jerald W. Pruitt, to me known to be the person described in and who executed the foregoing instrument, and acknowledged that he executed the same as his free act and deed.

IN WITNESS WHEREOF, I have hereunto set my hand and affixed my official seal at my office in Johnson County, Kansas the day and year last above written.

(SEAL)



James M. Lambeth
Name: James M. Lambeth
Notary Public in and for said State

My Commission Expires: 10-29-04

CAMPBELL, BARBER, LAMBETH AND ASSOCIATES, P.A.

Consulting Engineers and Land Surveyors

6223 Slater, P.O. Box 315

Shawnee Mission, Kansas 66201

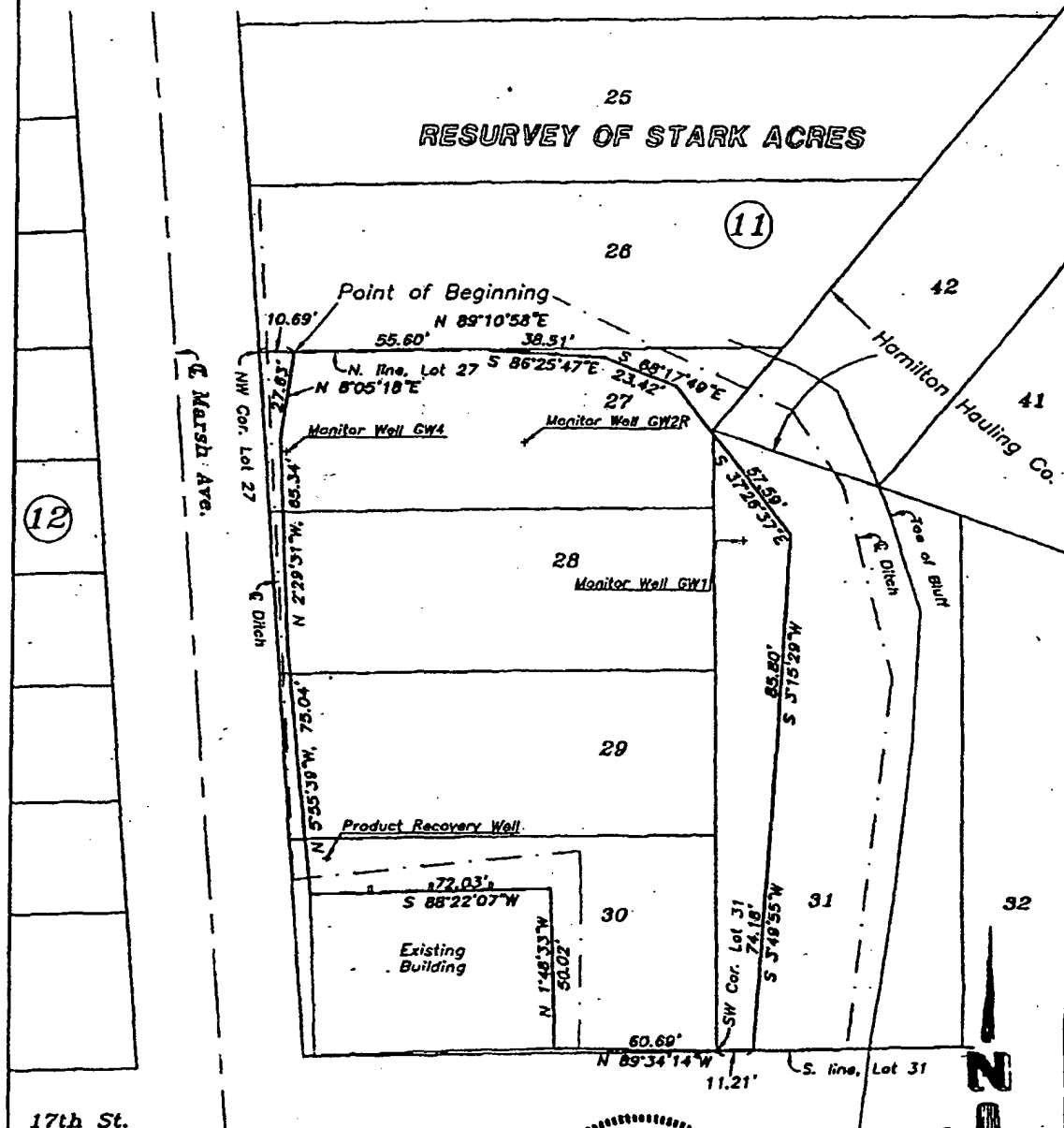
Tele. (913)722-1220 Fax (913)722-1223

Industrial Services Corporation

1633 Marsh Avenue, Blue Summit, Missouri

Description Plat of Plastic Liner

Description: Parts of Lots 27, 28, 29, 30, and 31, Block 11, RESURVEY OF STARK ACRES, a subdivision in Jackson County, Missouri, being more particularly described as follows: Beginning at a point on the North line of said Lot 27, 10.69 feet East of the Northwest corner of said Lot 27; thence North 89 degrees, 10 minutes, 58 seconds East along said North line, 55.60 feet; thence South 86 degrees, 25 minutes, 47 seconds East, 38.51 feet; thence South 68 degrees, 17 minutes, 49 seconds East, 23.42 feet; thence South 37 degrees, 26 minutes, 37 seconds East, 57.59 feet; thence South 3 degrees, 15 minutes, 29 seconds West, 85.80 feet; thence South 3 degrees, 49 minutes, 55 seconds West, 74.18 feet to a point on the South line of said Lot 31 and 11.21 feet East of the Southwest corner of said Lot 31; thence North 89 degrees, 34 minutes, 14 seconds West, 60.69 feet; thence North 1 degree, 48 minutes, 33 seconds West, 50.02 feet; thence South 88 degrees, 22 minutes, 07 seconds West, 72.03 feet; thence North 5 degrees, 55 minutes, 39 seconds West, 75.04 feet; thence North 2 degrees, 29 minutes, 31 seconds West, 65.34 feet; thence North 8 degrees, 5 minutes, 18 seconds East, 27.63 feet to the point of beginning.



17th St.

I hereby certify that to the best of my knowledge, the above and correctly portrays the results of a survey of the above described property. That said survey was conducted under my supervision; and said survey meets the Missouri Minimum Standards For Property Boundary Surveys For An Urban Survey.

SIGNED: JEFFREY P. FRUIT, L.S. 2347

DATE: November 5, 2000

LAND SURVEYOR

Revised: 11/05/00, corrected distance in description.

10/18/00

Job No. 070017

Scale 1" = 40'



2001I 0004388

JACKSON COUNTY DEPARTMENT OF RECORDS
303 WEST KANSAS
INDEPENDENCE, MO 64050

RECORDER OF DEEDS DOCUMENT IDENTIFICATION & CERTIFICATION SHEET

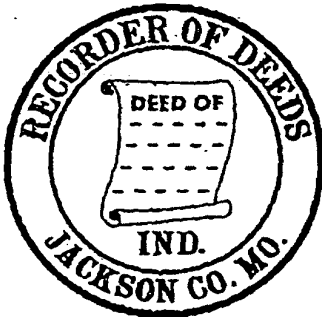
TYPE OF INSTRUMENT: PARTIAL PRINCIPALS IDENTIFIED FROM DOCUMENT FOR DOCUMENT TRACKING PURPOSES
REST RESTRICTIONS: PT LOTS 27-31 BLOCK 11 RESURVEY OF STARK ACRES
BRIEF PROPERTY DESCRIPTION: PT LOTS 27-31 BLOCK 11 RESURVEY OF STARK ACRES

NOTE: Document information on this certification sheet is furnished as a convenience only, and in the case of any discrepancy between same and the attached instrument, the attached instrument governs. The Recorder's official Grantor/Grantee indices are created from the information contained in the actual instrument attached hereto.

STATE OF MISSOURI)
SS.
COUNTY OF JACKSON)

I, the undersigned Recorder of Deeds for said County and State, do hereby certify that the following and annexed instrument of writing, which consists of 4 pages (this page inclusive), was filed for record in my office on the 24 day of January, 2001, at 11:04:41 and is truly recorded as the document number shown at the top and/or bottom of this page.

In witness whereof I have hereunto set my hand and official seal the day, month and year aforesaid.



Fees:
MO HOUSING TRUST FUND 001-2473 \$3.00
HOMELESS 043-250-2195 \$3.00
RECORDING FEE \$14.00
USER FEE \$4.00

Mary H. Murphy

Director of Records
Jackson County, MO

A. Garmon
Recording Deputy

Recording Fee: \$24.00
(Paid at time of Recording)

Return to:

MORRISON & HECKER
2600 GRAND AVENUE
KANSAS CITY, MO 64108-4606

Document Number / Book & Page:
2001I 0004388 (1 - 4)

PLEASE DO NOT REMOVE THIS
PAGE FROM THE DOCUMENT

NOTATION OF LAND USE RESTRICTION

KNOW ALL MEN BY THESE PRESENTS, that Quality Analytical Services, Inc., a Missouri corporation, the owner of the real property (hereinafter referred to as the "Land") located on parts of Lots 27, 28, 29, 30, and 31, Block 11, RESURVEY OF STARK ACRES, a subdivision in Jackson County, Missouri, and more particularly described in Exhibit A attached hereto and incorporated herein by reference, and in the survey filed of record in the Office of the Recorder of Deeds for Jackson County, Missouri in Book * , Page , hereby files this Notation of Land Use Restriction for the purpose of giving notice that the Land has been used to manage hazardous and non-hazardous waste and that use of the Land is restricted under 10 Code of State Regulations 25-7.265 effective January 30, 1999. This restriction runs with the Land and binds all current owners and their heirs, successors, executors and assigns. This notation and the aforementioned survey have been filed in the Office of the Recorder of Deeds for Jackson County, Missouri and with the Director of the Hazardous Waste Program for the Missouri Department of Natural Resources. Information concerning the type, location and quantity of hazardous waste remaining on the Land has been filed with the Jackson County, Missouri Zoning Department, the Director of the Hazardous Waste Program for the Missouri Department of Natural Resources, and the Regional Administrator for the United States Environmental Protection Agency, Region VII. *2001I0004387

IN WITNESS WHEREOF, Ronald D. Deffenbaugh has executed this notation this 12 day of January, 2000. 2001

QUALITY ANALYTICAL SERVICES, INC.
f/k/a Industrial Services Corporation

By:

Ronald D. Deffenbaugh
Ronald D. Deffenbaugh, President

EXHIBIT A

Parts of Lots 27, 28, 29, 30, and 31, Block 11, RESURVEY OF STARK ACRES, a subdivision in Jackson County, Missouri, being more particularly described as follows: Beginning at a point on the North line of said Lot 27, 10.69 feet East of the Northwest corner of said Lot 27; thence North 89 degrees, 10 minutes, 58 seconds East along said North line, 55.60 feet; thence South 86 degrees, 25 minutes, 47 seconds East, 38.51 feet; thence South 68 degrees, 17 minutes, 49 seconds East, 23.42 feet; thence South 37 degrees, 26 minutes, 37 seconds East, 57.59 feet; thence South 3 degrees, 15 minutes, 29 seconds West, 85.80 feet; thence South 3 degrees, 49 minutes, 55 seconds West, 74.18 feet to a point on the South line of said Lot 31 and 11.21 feet East of the Southwest corner of said Lot 31; thence North 89 degrees, 34 minutes, 14 seconds West, 60.69 feet; thence North 1 degree, 48 minutes, 33 seconds West, 50.02 feet; thence South 88 degrees, 22 minutes, 7 seconds West, 72.03 feet; thence North 5 degrees, 55 minutes, 39 seconds West, 75.04 feet; thence North 2 degrees, 29 minutes, 31 seconds West, 65.34 feet; thence North 8 degrees, 5 minutes, 18 seconds East, 27.63 feet to the point of beginning.

STATE OF KANSAS)
) SS.
COUNTY OF JOHNSON)

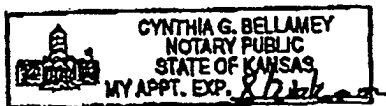
On this 12th day of January, 2001, before me, the undersigned, a Notary Public, appeared Ronald D. Deffenbaugh, to me personally known, who being by me duly sworn, did say that he is the President of Quality Analytical Services, Inc., f/k/a Industrial Service Corporation, a Missouri corporation, that said instrument was signed on behalf of said corporation, and Ronald D. Deffenbaugh acknowledged said instrument to be the free act and deed of said corporation.

IN WITNESS WHEREOF, I have hereunto set my and affixed my official seal at my office in Shawnee, Kansas, the day and year last above written.

Cynthia G. Bellamey
Notary Public in and for said County and State

My Commission Expires:

8/6/2002



DEFFENBAUGH INDUSTRIES, INC.

POST OFFICE BOX 3220
SHAWNEE, KANSAS 66203
913-631-3300

January 12, 2001

Mr. Mark Trosen
Manager of Planning and Zoning
Jackson County
103 North Main
Independence, Missouri 64050-2861

Ms. Cindy Kemper
Director
Hazardous Waste Management Program
Missouri Department of Natural Resources
P.O. Box 176
Jefferson City, Missouri 65102-0176

Mr. Dennis Grams
Regional Administrator
Region 7
United States Environmental Protection Agency
901 North 5th Street
Kansas City, Kansas 66101

Re: Notice of Filing Land Use Restriction on 1633 Marsh Avenue, Blue Summit, Missouri

Dear Mr. Trosen, Ms. Kemper and Mr. Grams:

This letter serves as formal notification that a restrictive notation has been filed by Quality Analytical Services, Inc. (formerly known as Industrial Services Corporation), an affiliate of Deffenbaugh Industries, Inc., concerning the remediation of certain hazardous wastes at 1633 Marsh Avenue, Blue Summit, Missouri. The interim corrective measure has been completed and a notation has been filed with the Jackson County Recorder of Deeds in accordance with 10 CSR 25-7.265. The regulations require that information concerning the type, location and quantity of hazardous waste remaining on the property be filed with your offices.

This letter serves as formal notification of the type, quantity and location of the hazardous waste that remains on-site. Below is a description of the type, quantity and location of hazardous waste.

TYPES OF HAZARDOUS WASTE IN SOILS

VOLATILE ORGANIC COMPOUNDS

Acetone
Benzene
2-Butanone
n-Butylbenzene
sec-Butylbenzene
Carbon disulfide
cis-1,2-Dichloroethene
Chloroethane
1,1-Dichloroethane
Ethylbenzene
Isopropylbenzene
p-Isopropyltoluene
Methylene chloride
Methyl chloride
(Chloromethane)
n-Propylbenzene
Tetrachloroethene
1,1,2,2-Tetrachloroethane
Toluene
1,1,1-Trichloroethane
1,2,4-Trimethylbenzene
1,3,5-Trimethylbenzene
Trichloroethene
Vinyl chloride
Xylene (Total)

SEMI-VOLATILE ORGANIC COMPOUNDS

Acenaphthene
Anthracene
Benzo(a)anthracene
Bis(2-ethylhexyl)phthalate
Chrysene
Dibenzofuran
Diethylphthalate
Fluoranthene
Fluorene
2-Methylnaphthalene
Naphthalene
Butyl benzyl phthalate
N-Nitrosodiphenylamine
Phenanthrene
Pyrene
HERBICIDES
2,4-D
2,4,5-TP (Silvex)
PESTICIDES AND PCBS
beta-BHC
gamma-BHC
Heptachlor
PCB-1260

DIOXINS AND FURANS INORGANICS

Sulfide, Total
Hexavalent chromium
METALS
Aluminum
Antimony
Arsenic
Barium
Beryllium
Cadmium
Calcium
Chromium
Cobalt
Copper
Iron
Lead
Magnesium
Manganese
Mercury
Nickel
Potassium
Silver
Thallium
Tin
Vanadium
Zinc

LOCATION OF HAZARDOUS WASTE IN SOILS


Parts of Lots 27, 28, 29, 30, and 31, Block 11, RESURVEY OF STARK ACRES, a subdivision in Jackson County, Missouri, being more particularly described as follows: Beginning at a point on the North line of said Lot 27, 10.69 feet East of the Northwest corner of said Lot 27; thence North 89 degrees, 10 minutes, 58 seconds East along said North line, 55.60 feet; thence South 86 degrees, 25 minutes, 47 seconds East, 38.51 feet; thence South 68 degrees, 17 minutes, 49 seconds East, 23.42 feet; thence South 37 degrees, 26 minutes, 37 seconds East, 57.59 feet; thence South 3 degrees, 15 minutes, 29 seconds West, 85.80 feet; thence South 3 degrees, 49 minutes, 55 seconds West, 74.18 feet to a point on the South line of said Lot 31 and 11.21 feet East of the Southwest corner of said Lot 31; thence North 89 degrees, 34 minutes, 14 seconds West, 60.69 feet; thence North 1 degree, 48 minutes, 33 seconds West, 50.02 feet; thence South 88 degrees, 22 minutes, 7 seconds West, 72.03 feet; thence North 5 degrees, 55 minutes, 39 seconds West, 75.04 feet; thence North 2 degrees, 29 minutes, 31 seconds West, 65.34 feet; thence North 8 degrees, 5 minutes, 18 seconds East, 27.63 feet to the point of beginning.

QUANTITY OF SOIL ON SITE THAT MAY CONTAIN HAZARDOUS WASTE

Approximately 10,000 cubic yards.

Please direct any questions concerning this matter to the site's project manager, Mr. Al Slavik. Mr. Slavik can be reached at 913-631-3300 or via fax at 913-631-3996.

Sincerely,


Ronald D. Deffenbaugh
President